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Devoted to the Manufacture of Textiles.

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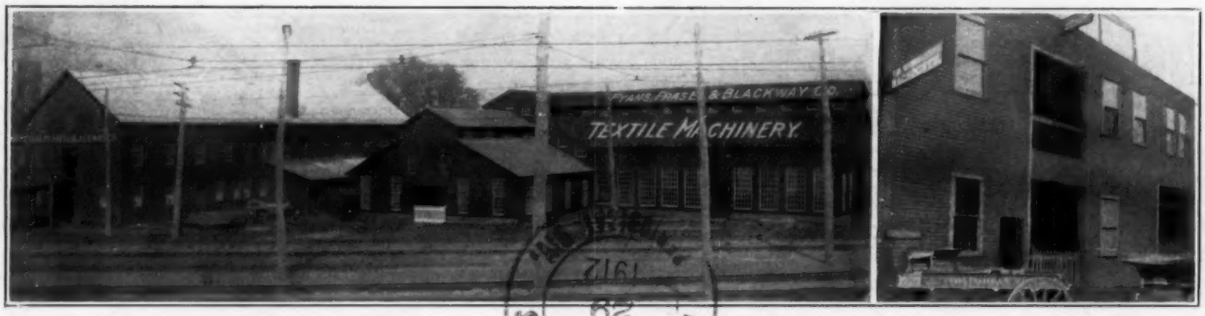

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THE 56-HOUR LAW IN MASSACHUSETTS.

A number of strikes and considerable discussion have resulted from the operation of the 56-hour labor law of Massachusetts that went into effect at the beginning of the new year. The chief cause of complaint among the operatives has been the decrease in the amount of money paid for 56 hours as compared with the amount accruing from 58 hours' work. Day workers have given expression of their dissatisfaction with the new condition more than have the operatives on piece work.

The portion of Section 48 of the Massachusetts Labor Law, that changed the number of hours of work is as follows: "From and after the first day of January nineteen hundred and ten, no child and no woman shall be employed in laboring in a manufacturing or mechanical establishment more than ten hours in any one day, except as hereinafter provided in this section, unless a different apportionment of the hours of labor is made for the sole purpose of making a shorter day's work for one day of the week, and in no case shall the hours of labor exceed fifty-six in a week."

The section does not prescribe the number of hours that men shall work, but the practical effect of its operation is the same, due to the fact that it is impracticable to operate a mill with only a small percentage of the help. In other words the men are placed on the same basis as the women and children in the number of working hours per week.

There was mild speculation in textile circles as to whether the mills would raise the rate of wages to counterbalance the loss of two hours per week in time, or continue the same rate which would mean a reduction in the total amount of wages received. The first pay day under the new law showed that the Fall River and other large mills did not increase the rate; this caused more or less trouble among the operatives and led to strikes as a protest against the smaller amount paid them. These operatives probably had in mind the fact that the Cotton Manufacturers' Association had only a short time ago waived its right to reduce the price per cut paid to weavers, and also the fact that it was no lack of willingness on their part to work 58 hours; but the operation of the law prevented.

The manufacturers' decision was probably based on the fact that the state of trade in the textile industry did not warrant an increase in the rate of wages and that the weavers while not having their rate actually reduced, would at the same time suffer a similar reduction in the amount received as with the day operatives, owing to the loss of the two hours.

It would seem that both sides were right to a certain extent, and it is encouraging to learn that the majority of the striking operatives have resumed their places in the mills. When conditions in the textile trade improve to

the extent that the mills can entertain an advance in rates to the operatives, the question will probably come up again for discussion and action.

PUBLISHING FACTS.

The value of a statement depends upon the authenticity of the information given. COTTON prides itself upon the fact that the correctness of its figures and other data is verified from some standard authority before giving such information to the public. Any paper which has consistently followed this the only safe course, and has won the confidence of its readers is justified in challenging any contradiction that would impugn the correctness of the information found in its columns.

COTTON published an editorial in its January issue, dealing with "Southern Prosperity and Industrial Development," and gave figures to emphasize the wonderful progress being made in this section. Such a compilation of facts was a revelation to many who have not kept in close touch with the reports relating to industrial development in the South, and a number of daily papers have devoted space to the subject, basing their figures on our editorial.

The Charlotte, N. C., "Observer" which for many years has been among the most able authorities of the Southern dailies on manufacturing was even amazed at the wonderful progress in water-power development, our statements seeming incredible to them. In its issue of January 18, it published an editorial on the subject and in quoting the amount of water-power development in the several Southern states made the statement to the effect that it could not agree to the figures given.

Our friend the "Observer" does not give its reasons. COTTON'S authority is the United States Geological Survey, Water Supply Paper 234, and should be correct. The "Observer" is seldom in error, so our conclusion is that the enormous development of Southern water-power has been carried on so quietly that its growth has extended beyond the observation even of that excellent daily.

PLANS OF THE SPINNERS.

For the yarn mills the successful solution of the price problem has not been apparent up to the present time. This is due in great measure to lack of a concerted movement among the mills in applying the methods recommended by the experienced men in the industry.

The gravity of the situation has long been felt by some of the mills and efforts of a more or less individual character have been made to bring about co-operation, but however, with little or no success. Other yarn mills have now reached the stage where the unusual conditions affect them, and the necessity for a concerted movement is felt by the majority of the Southern spinners.

As a result, a representative gathering of yarn men and commission agents was held in Charlotte, N. C., in the early part of last month to discuss the situation and hear recommendations.

A resolution was passed in which the recommendation was made for a schedule of prices for ply yarns to be adopted by all of the Southern yarn mills. The keynote of the conference was a plea for concerted action among the mills, by insisting upon the prices named or by curtailing when those prices could not be obtained. In other words, it had been found by experience that individual price making and half hearted curtailment had not worked to the best interests of the mills. Prominent men in the industry showed clearly that it was the duty of each mill to work along the lines prescribed in the resolution, and thus aid in bringing about the results desired. The mills have probably never had such an acute situation confronting them and it is significant that the gathering of practically all of the Southern yarn spinners was the first of its kind ever held for the specific purpose of discussing the best method of meeting so critical a condition.

The meeting also gave evidence that the adjustment must be brought about by the mills themselves, and the only effective method is for each mill to become a unit in the plan of operation. It is to be regretted that such a meeting was not called in September, 1909, when the subject of curtailment was discussed by mill men generally.

A CORRECTION.

In the January issue of COTTON appeared a large number of exclusively contributed articles by prominent public spirited men who for the public welfare and at the expenditure of time and trouble had put this matter in shape for publication. That the articles should contain nothing ever before publicly uttered by their authors, could not be and was not expected by the editor of COTTON. One of the contributed articles appeared in the January special issue of a contemporaneous textile magazine; thus its influence was wider, and most accomplished the generous purpose of its author. COTTON'S editor regrets only that his own misunderstanding led to the statement that the article was exclusively for us. In another instance the author furnished a slight re-arrangement, with new illustrations, of an address delivered by him before a Y. M. C. A., welfare convention held in Charlotte, N. C., in March, 1909. It's author had not offered it as a contributed article to any publication previous to its appearance in COTTON. It is more than probable that other of the prominent contributors to the January edition of COTTON made re-mention of sentiments and statements previously expressed in print or public addresses.

That the errors, if they be such, as explained above should be made the subject of violent criticism impugning honor and integrity is almost beyond conception. If, however, by any possible construction this may be construed as has the editorial utterance of a contemporary, then COTTON'S editor and through him its publishers wish to assume all responsibility; for under no condition and in no possible way can any accusation of misrepresentation be made against other than ourselves. To the generous aid of the public spirited men who helped us so splendidly to make the January issue of wide interest and value to Southern men, we are much indebted and most grateful.

In speaking of the discovery of the parasite known as the "hook worm" by a German physician in 1782, Dr. Charles W. Stiles said that the doctor was dissecting an animal and found a new parasite which from its form he called a "hook worm." Later, hook worms were found in sheep, dogs and cattle. In 1837 an Italian found a new parasite in the human body and was known as the "old world hook worm." In 1861, it was found that the parasite was common in Egypt and even more so in Brazil.

MEETING OF THE SOUTHERN TEXTILE ASSOCIATION.

The Southern Textile Association will hold its first meeting of the new year at Columbia, S. C., on February 19, 1910. At the last meeting held in October, a resolution was adopted to the effect that three meetings a year should be held instead of four as formerly. The meetings will be held accordingly in February, July and October. The committee having the arrangement of the February meeting in hand consists of W. P. Hamrick, W. A. Black and C. R. Riddle. The committee has been making extensive preparations for a large attendance, and is preparing a program that will be especially interesting. An incomplete list of the papers to be read is as follows:

"Address of Welcome," by Mayor W. S. Reamer, Columbia, S. C. Response to address of welcome by N. T. Brown, Raleigh, N. C. "Development of Welfare Work," by J. M. Davis, Newberry, S. C. "Cotton Carding," by R. D. Thomas, Charlotte, N. C. "The Spinning Room," by George F. Brietz, Bon Air, Ala. "Mill Life in the South," by A. S. Winslow, Clinton, S. C. "Power Plant Costs," by S. B. Rhea, Charlotte, N. C. "The Dye House," by "A Dyer." Another paper will be on "The Weave Room," to be added to the program.

CONFERENCE OF SOUTHERN SPINNERS.

A large and important meeting of Southern spinners and commission men from Boston, New York and Philadelphia was held in Charlotte, N. C., on January 4, 1910, for the purpose of discussing conditions existing in the cotton industry, and devising a possible remedy. There were present at the conference about 150 spinners, representing over 1,000,000 spindles, and about 50 representatives of yarn commission houses. The meeting was regarded as one of the most important ever held in the South.

A resolution was adopted by the meeting fixing a schedule of minimum prices for cotton yarns, and agreeing upon curtailment in case the prices set could not be secured. The proposed resolution was thoroughly and ably discussed by a number of those present, and a campaign of education was urged among the spinners of the South, to the end that they should learn to count the cost of manufacture before fixing their prices, and then stand firm in their refusal to accept orders at any price below these figures.

The first session, held in the morning, was called to order by D. A. Tompkins, Charlotte, N. C., with T. W. Crews, of Charlotte, N. C., as secretary. The official call for the meeting was read, with a further explanation of the object sought, and a review of the situation in the yarn market. On motion a committee was appointed to secure reports from the spinners and yarn men as to the stocks on hand, etc., confer about the matter, and formulate a statement to include a uniform schedule of minimum prices for hard and soft yarns, to be submitted to the general session in the afternoon. The committee consisted of R. R. Ray, McAdenville, N. C., chairman, W. D. Anderson, Macon, Ga., and J. F. Taylor, Kinston, N. C., who were to prepare prices on yarns from 1 to 12s; W. B. Moore, Yorkville, S. C., and Geo. B. Hiss, Charlotte, N. C., yarns from 12s to 20s; J. P. McRae, Laurinburg, N. C., and E. H. Williams, Fayetteville, N. C., yarns from 20s to 30s; M. M. McCall, Opelika, Ala., and W. S. Weir, Charlotte, N. C., yarns from 30s to 40s; J. Kelly Dixon, Gastonia, N. C., and J. E. Wardlaw, Yorkville, S. C., yarns from 40s to 50s; and S. B. Tanner, Charlotte, N. C., 50s to 60s yarns.

The resolution as prepared and adopted was as follows:

"Resolved, That we recommend the adoption of the following schedule of prices, and unless these prices can be obtained, then we urge immediate curtailment:

	Hard.	Soft.
8s 2-ply	24	24½
8s 2 and 3-ply	24½	25
10s 2 and 3-ply	25	25½
12s 2 and 3-ply	25½	26
14s 2 and 3-ply	26	26½
16s 2 and 3-ply	26½	27
20s 2 and 3-ply	27½	28
24s 2 and 3-ply	28½	29
26s 2 and 3-ply	29	29½
30s 2 and 3-ply	30	30½
36s 2 and 3-ply	36	36
40s 2 and 3-ply	39	..
50s 2 and 3-ply	44	..
60s 2 and 3-ply	50	..

In presenting the resolution to the afternoon session, Chairman R. R. Ray stated that the committee in preparing the figures given in the schedule, had merely counted the cost of producing the yarns, and was not allowing any margin for profit, the idea being for the mills to agree upon a minimum price that would save them from loss during the existing disparity between the prices of cotton and cotton yarns. In the general discussion that preceded the adoption of the resolution, W. D. Anderson, Macon, Ga., of the committee, and regarded as one of the best informed spinners in the South, presented a method of figuring the actual cost of goods on the present basis of the raw material. It was stated that this was the first time that a mill man had ever publicly declared the actual cost of the manufacture of goods. The calculation was as follows:

Raw material 16 cents a pound; estimated waste 15 per cent.; calculation based on 20s yarn. Net cost of cotton, eliminating waste, 18.80 cents a pound.

	Cents a Pound
Cotton	18.80
Hire (pay roll help)	1.75
Findings	.50
Taxes, insurance, power, salaries of officers, interest, depreciation	1.25
Total cost of manufacture at mill	22.30
Freight	.50
Discount for cash, 3 per cent.	.75
Commission for selling, 5 per cent.	1.25
Aggregate cost delivered	24.80

Mr. Anderson stated that the items given were average figures, and were as nearly accurate as it was possible to get them, they having been taken from his own experience covering a period of several years in the manufacture of yarns. In a further discussion of the resolution as to its effect upon improving the situation, Sumner B. Sargent, of Charlotte, N. C., stated that he did not think

any benefit would be apparent, unless individual spinners would stand firm in the determination to get at least the minimum price or nothing at all. He stated further that the proposition was one for the individual to settle, and that no resolution unless backed up and buttressed by the manly minds of the individuals could ever achieve success.

Of the commission men, Lewis T. Muller of Muller, Riddle & Co., Philadelphia, Pa., stated that all spinners not securing cost for their manufactured goods should close down and wait until that price at least could be procured. It was agreed at the meeting that the conference had no power to bind its members, but it was generally agreed that, in the light of present conditions in the industry, and the spirit of earnestness and determination that characterized the gathering, the resolution would be considered morally binding on the spinners, and that the meeting would result in much good to the industry. The conference requested the committee to continue meeting in the future as it may see fit and advising the members of the conference as there may be occasion.

COMPARISONS OF BELT, ROPE AND ELECTRIC DRIVES IN COTTON MILLS.

HISTORY OF THE DEVELOPMENT IN POWER TRANSMISSION. BELT DRIVE. ROPE DRIVE. MANILLA AND COTTON ROPE COMPARED.

(*Contributed exclusively to* COTTON.)

BY HENRY DOCKER JACKSON.

The use of leather belting for power transmission purposes in cotton mills has not been of sudden growth, but was due to the gradual replacement of the older methods of drive, such as the distribution of power from a vertical shaft by means of bevel gears to the various line shafts as shown in Fig. 1. At one time the machinery itself was for a large part operated by means of bevel gearing and shafting. In the early 60's, belts first replaced shafting and gearing between main line and machinery, and an arrangement was had as shown in Fig. 2. Belts proved so satisfactory not only in their ability to drive, but also on account of reduction of noise and friction that belting was soon made to replace the vertical shaft. The ordinary method of distribution was to transmit the power from the prime mover to one line shaft that ran all of the machinery on the lower floor, thence by belts to the other floors. The shafting on the first floor was made heavy enough not only to transmit the power on that floor, but also to carry the power required to be transmitted to the floors above. The power plant was generally situated at one end of the mill. By 1870, belting had entirely replaced geared shafting for all transmission purposes in cotton mills. A great improvement in this method of drive was the installation of the power plant in the middle of the mill, enabling the main shafting to be made much lighter, and thereby doing away with a good deal of the friction as well as reducing the first cost.

A still further increase in the efficiency of power distribution was made by means of the belt tower, which enabled the power to be distributed direct from the fly wheel of the engine or of the water wheel, to the various floors without the necessity for passing through the intermediate shafting. This arrangement is illustrated in Fig. 3. This method resulted in a considerable decrease in the size of the intermediate shafting, and obviated the cumulative effect of friction losses in the various line shafts. During the succeeding years, great improvements were made in the belting itself, as well as in the pulleys and the shafting; this resulted in increased life of the belts and the possibility of transmitting a larger amount of power with the same sized belt. Many manufacturers, however, went beyond the economical limit and installed belts which were too narrow for the required work. This resulted in a great many belt breakages with consequent shutting down and loss in production.

At the same time, however, the increased cost of leather belting brought about a study to determine whether or not some other method of drive could not be devised which would be less costly to install than the belt and more reliable, and produce less friction. With the belt drive it had been found that there was a difference in speed of the machinery due to the slipping of the belts between the machinery and the prime mover when the machinery was loaded and not loaded. This loss of course increased as the belts became more and more overloaded. It was also found more or less difficult to keep the belts at the proper tension, which would enable the power to be uniformly distributed. Thus they required more or less frequent taking up, which is difficult in large belts.

It was also found that the various long lines of shafting necessary for the distribution of the power to the various rooms in the mill, were more or less costly to keep in line,

VERTICAL ENGINE WITH GEARED FLY WHEEL.

and that the power loss increased very rapidly if the alignment was imperfect. It was found difficult to plan the mill so that future additions could be made economically, and the power transmitted most advantageously after the additions had been made. If a plant was built with the idea of future expansion, the power loss under these conditions

would be small, and the belts, shafting, bearings, etc., would show excellent results, but when additional load was put on, the belts would begin to fail rapidly, bearings would give trouble, and the general result would be by no means satisfactory.

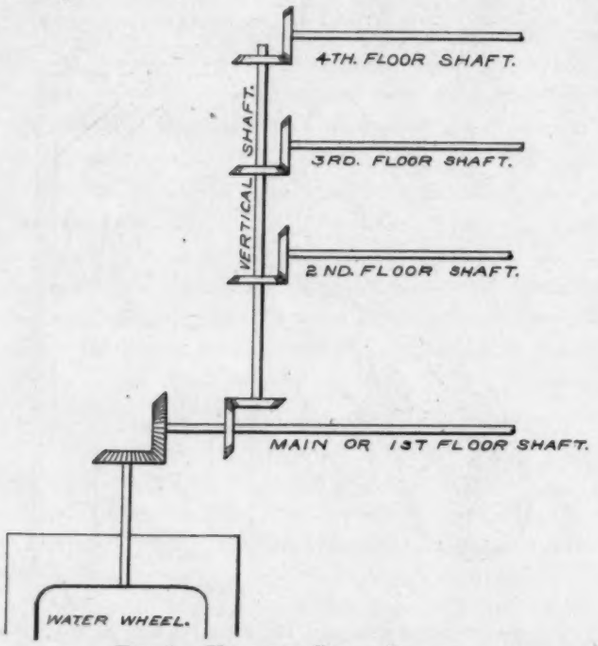


FIG. 1. VERTICAL SHAFT DRIVE.

Another source of annoyance from belt drives was variation in speed due to the cutting in or out of various machines requiring large powers, which tended to start the belts slapping or waving. This slapping or waving would be transmitted over the entire plant, and also reduce the productive capacity of the plant directly in proportion to this variation in speed. The annoyance and care of large belts operating between main line shafting and countershafting were also large items, some of which were the friction of these belts in the belt boxes with the possibility of fire therefrom, the stirring about of lint and dust in the mill, the cutting off of the light, and the amount of room required for the installation of these belts.

To overcome these difficulties, ropes for main drives were tried, these being installed in the early 80's. The early rope drives, however, were very inefficient, in fact the results were so disastrous that even to-day the older mill managers and many of those who were brought up under them, can not be made to see that there is any advantage in the use of rope drives. The claims of advantage of the rope drive are: It is less noisy; static electricity is absent; there is practically no loss of power or speed from slipping; there is no trouble in transmitting power over long or short distances; and as a rule it is less costly to install and maintain than belting.

The belt manufacturer, however, disputes these statements vigorously, claiming that the life of a leather belt is two or three times as long as that of rope drive. Opinions differ even among rope manufacturers as to the length of life of the rope drive. The American transmission rope is made of Manilla, which is used owing to the great strength of these fibers and comparatively low cost. These fibers, however, are in themselves harsh and rough, and of a nature which make it impossible to compress them into a uniform mass, with the result that when in service, the fibers rub over one another, tending to cut and destroy, and necessitating internal lubrication. To further avoid this trouble, the American rope is made with a central core. The rope is usually four-stranded, although six-stranded rope is being made. The rubbing or grinding of the fibers in these ropes takes place only when the ropes are bent around the pulleys, and increases in proportion to the decrease in the diameter of the pulley.

The rope manufacturers in America, therefore, have limited the size of the pulley to not less than 40 times the diameter of the rope, and even under these conditions the American rope manufacturer will not guarantee the rope to transmit its full rated power with a life of over eight years. Frequently owing to careless installation and lack of care this life is not reached. Naturally the belt manufacturer enlarges upon these conditions and compares the life of Manilla rope to the life of belting, which if installed under small tension and under proper conditions, may have a life exceeding thirty years.

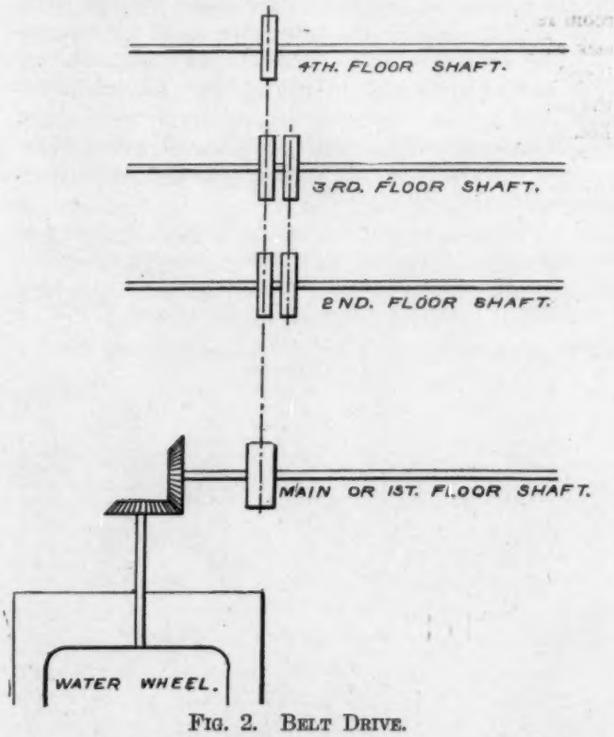


FIG. 2. BELT DRIVE.

This brings about the discussion of what is small tension for belts, and what are proper conditions. The usual rating for belting is that a single one-inch belt running at 1,000 feet per minute will transmit 1 horse-power, with a working tension of 33 pounds. Double belts will transmit 1½ times the amount of a single belt, this is, based on an arc of contract of 180 degrees. F. W. Taylor made many experiments on moderate sized and small belts, and came to the conclusion that for leather the effective pull on the face of the belt should be 35 pounds per inch, and that the effect of running above the strain of 35 pounds was to decrease the life of the belt very materially. Under the above conditions, 950 feet per minute will transmit 1 horse-power. It was found that if a belt was proportioned so that it had an effective pull of 65 pounds per inch of width and was treated with great care, it would run night and day at a moderate speed for seven years. A belt proportioned so that the effective pull was 26 pounds per inch of width would, when treated with the same care and under the same conditions, last eighteen years. The cost of labor and materials used in the maintenance and repair of the belts was

over one-third of the original cost under the first conditions, and less than one-seventh under the second, showing very conclusively the necessity for proper arrangement and proper proportioning of belt pull in order to obtain long life of the belt.

The foreign rope manufacturer, however, has succeeded in making a rope, which, from results reported in foreign mills, shows that it is transmitting power greatly in excess of those listed by the American manufacturers. These foreign ropes show a life of from twenty to thirty years and even longer periods.

There are installations where rope drives have replaced belt drives to very great advantage, not only as regards the room required, but the decreased wear on the bearings, and lack of slipping, thereby increasing productive capacity and length of life. There are cases where cotton rope which is the type of rope used abroad, has replaced Manilla rope, the Manilla rope having been unsatisfactory and worn out after a few months' use while the cotton rope lasted for over five years and was still in service. The Manilla rope in the first place had been installed to replace some leather belting which had proved worthless. In another instance, eight Manilla ropes of 2-inch diameter, and ten of 1¼-inch diameter, were replaced by six and eight cotton ropes respectively, with satisfaction.

An interesting comparison may be made in the following tables between the rated horse-power capacity of cotton ropes and Manilla ropes of the same size and under the same conditions as regards velocity in feet per minute.

MANILLA ROPE.*

Rope Diameter.

Velocity in Ft. per Min.	1" H. P.	1¼" H. P.	1½" H. P.	1¾" H.P.	2" H.P.
1,000	4.	6.25	9.	12.25	16.
1,500	5.75	9.25	13.25	18.	23.5
2,000	7.5	11.75	17.	23.5	30.5
2,500	9.25	14.5	20.5	28.	36.75
3,000	10.5	16.5	23.5	32.25	42.
3,500	11.5	18.25	26.25	35.5	46.5
4,000	12.5	19.5	27.75	38.	49.5
4,500	12.75	20.	28.75	39.25	51.25
5,000	12.75	20.	28.75	39.25	51.25
5,500	12.5	19.5	28.	38.	49.75
6,000	11.5	18.	26.	35.25	46.

COTTON ROPE.†

Rope Diameter.

Velocity in Ft. per Min.	1" H. P.	1¼" H. P.	1½" H. P.	1¾" H.P.	2" H.P.
1,000	3.3	5.1	7.4	10	13.
1,500	4.9	7.6	11.1	15	19.6
2,000	6.5	10.1	14.9	20	26.1
2,500	8.1	12.6	18.5	25	32.6
3,000	9.7	15.1	22.3	30	39.1
3,500	11.3	17.7	26.	35	45.7
4,000	13.	20.2	29.7	40	52.2
4,500	14.6	22.7	33.4	45	58.7
5,000	16.2	25.3	37.1	50	65.3
5,500	17.8	27.8	40.9	55	71.8
6,000	19.5	30.3	44.6	60	78.3
6,500	21.1	32.9	48.3	65	84.9
7,000	22.7	35.4	52.	70	91.4

These tables show that the power transmitted by cotton rope is far in excess of that transmitted by Manilla of the same size at ordinary speeds, around 5,000 feet per minute, and to this may be added the fact that it is perfectly feasible to run a cotton rope at a speed of 7,000 feet per minute, whereas the tables on Manilla rope show that 6,000 feet per minute is the limiting speed. This is very largely due to the fact that cotton rope wedges more firmly into the groove of the pulley, neutralizing the effects of centrifugal force. To this can be added the fact that the life of the cotton rope is from two to three times that of Manilla rope. Further, it has been found that the minimum diameter of pulleys required for cotton rope is only 30 times the diameter of the rope as compared to 40 times for Manilla.

* Figures compiled by Plymouth Cordage Co.
†Figures compiled by Edward Kenyon in "The American Machinist."

Belt manufacturers claim that one of the great advantages of belts is the possibility of using tight and loose pulleys, enabling the machinery to be started and stopped without the necessity of clutches or of shutting down the plant. This can be done equally well with ropes, if proper precautions are taken. For vertical drives, ropes are very greatly superior to belts, as no idlers are required if the rope

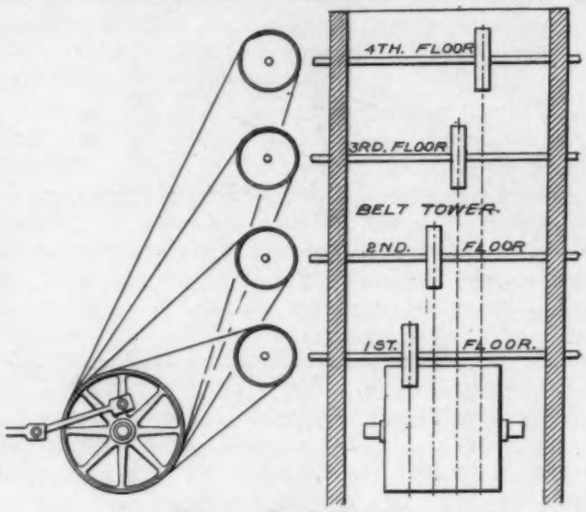


FIG. 3. ROPE DRIVE.

grooves are properly designed, the rope tending to hug into the groove on the tight side, and freeing itself at the discharge point without difficulty and not requiring to be under any great tension. A belt drive requires an idler on the slack side to prevent the belt from dropping away from the lower pulley, and the tension caused by this idler added to the great weight of the belt, brings additional strain on the overhead shaft, requiring a very stiff shaft as well as large and expensive bearings.

For those purposes requiring quarter turns or angle drives, the rope drive is superior to the belt, and so far as the space required, there is usually no comparison. Another feature of considerable importance in rope driving as compared to belts is that if the multiple system is employed, which is the only logical system for transmitting any considerable amount of power, proper continuity is secured. If one rope breaks, those which are left will have sufficient capacity to carry the greater part, if not the entire load on that shaft, whereas if a belt breaks, all of the shafting dependent upon that belt will be shut down until repairs are made.

It is unquestionably easier and simpler to make a splice in a rope, particularly a 3-stranded rope, than a splice in a belt of equivalent size. It is very simple and easy to allow for future expansion on rope drive by providing at first a pulley with extra sheaves. An objection in a milder form exists here similar to belts—that of having the shafting made sufficiently heavy to carry the maximum power desired, due to the proposed expansion of power. This shafting, however, can be made lighter than for belts, owing to the fact that the bearings can be placed closer together, as the transmission sheaves are narrower than belt pulleys, thus allowing the shafting to be figured for tension only. Again, since ropes and rope sheaves are lighter than the pulleys and belts, the shaft bearings may be made lighter, and in general the original cost of a well laid out rope drive will be less than that for a belt laid out for the same ultimate power.

This question of ultimate cost is one of extreme importance and takes into account not only the first cost of the layout, but also the effect of possible break-downs, the cost of repairs, and the cost of maintenance. These factors should always be very carefully balanced, in order to determine what the effective life of any transmission apparatus should be. It has been shown that there is practically no slipping with a properly designed rope drive, and that the speed of machinery at the extreme end of a mill holds practically constant through all the variations of load on the mill, so long as the engine speed remains constant. This is not true for belts, even when laid out for low belt tension, and this fact becomes more obvious as the tension on the belts increases. Rope drives are more economical and satisfactory for driving on very short centers, and it has been found perfectly feasible to drive by rope where the center distances were so short that the driving and driven pulleys come within a few inches of each other. It is equally possible to drive over very long centers, there being practically no limit to the length if supporting idlers are used.

To sum up the differences between belt and rope drives: The original first cost of the rope drive is less than that of an equivalent capacity belt drive, though much lighter; the life of the two is about the same. The productive capacity of the mill, owing to the steadiness in speed, is greater for the rope drive. The continuity of operation is more secure with the rope drive. There is more room available for manufacturing purposes, owing to the decreased width of the rope tower and also decreased width of the pulleys for the drive between the main line and counters for the rope drive. It is quite as feasible to cut out certain portions of the mill with one drive as with the other. Frictional electricity is entirely eliminated in the rope drive, and for special purposes, such as turning corners, angle drives, or vertical drives, the rope offers opportunities at a lower cost and less loss of power than the belt. The experience of cotton manufacturers who are using the rope drives in this country and abroad will bear out these statements.

Taken as a whole, the cotton mill owners in this country are averse to the use of ropes, but there is a growing demand for their installation, owing to the features outlined in the preceding paragraph; and were it not for the electric drive, it is likely that a very large proportion of the new mills now in process of construction, would utilize the rope in preference to the belt for the main drives. And it is very likely that in the future, many of the machines will be operated by ropes 1-inch diameter or less, from the countershafts to the machine, using shifting devices or friction clutches.

The experience abroad in many of the English, Scotch, and French mills has been very satisfactory with the use of ropes for driving spinning frames and other cotton machinery, and it is well known that many of the machines in cotton mills use cotton ropes for driving purposes, in the machines themselves, ropes being used as it has been found almost impossible to get satisfactory operation through any other means. These ropes are also of comparatively small size.

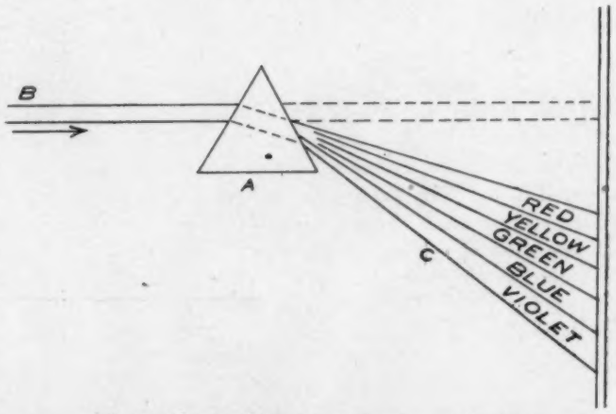
HARMONY AND CONTRAST OF COLORS.

(Contributed exclusively to COTTON.)

BY DAVID PATERSON, F. R. S. E., F. C. S.

Before commencing the study of the laws that regulate the harmony and contrast of colors, it might be well to refresh our memories on some of the more important facts in regard to the nature of color itself. There is perhaps nothing in nature which arrests our attention so readily as the phenomenon of color. We are all naturally fond of color; from the very cradle, the little child will stretch out its hands to grasp some brightly painted toy. Among the crude, uncivilized nations we always find a love for color—bright and gaudy colors. How we ourselves are charmed with the beautiful tints of the flowers, the butterflies, and the birds, the glories of the sunset with its clouds of purple and burnished gold, and the everchanging hues of sky and sea and woodland seen under all their varying moods.

How fascinating are the exquisite colors of the soap bubble, of mother of pearl, a beetle's wing, or a peacock's feather. All these simple objects of nature delight and charm us simply because of their color. Seeing, therefore, that we derive so much pleasure from the viewing of colors, it is very natural for us to ask ourselves the simple question: "What is color?" A question simple enough in itself and yet deep enough to perplex our greatest philosophers. And in order to comprehend a little of the wonder and mystery that surround the common faculty of seeing colors,



WHITE LIGHT PASSING THROUGH A PRISM.

it might be well to consider what color is, and the structure of the eye, which enables us to see light and color.

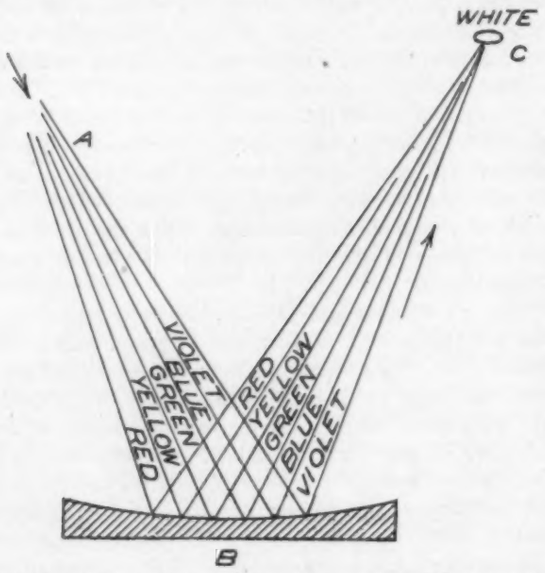
WHAT DAYLIGHT IS.

Every boy at school now knows of the method of decomposing white sunlight by passing a beam of it through a crystal prism as shown in Fig. 1. In its passage through the prism A, the ray of sunlight represented by B splits up into its constituent elements, forming a beautiful band of distinct colors C, termed the spectrum, ranging from red, orange, yellow, green and blue to violet.

The red light is the least refracted, or bent out of its course, by the prism, while the violet, is the most refracted; all of the intermediate colors lie between these two extremes. This simple and classical experiment, first performed by Sir Isaac Newton in 1665, showed that ordinary white sunlight is a delicately balanced mixture of all the colors of the rainbow. Our eyes can not analyze or

divide the differently colored rays present in the sunlight; so that the total effect of all the rays together on the eye produces the sensation of seeing a white light.

By a simple expedient as shown by diagram Fig. 2, the various colors of the spectrum can be recombined, and the result is white light again. The colored rays A, are reflected from a concave mirror B, and condensed to a focus C, of white light. But if this delicately balanced mixture of colored rays forming daylight be in the slightest



RECOMBINING COLORED RAYS INTO WHITE LIGHT.

way disturbed, we do not get white light but a colored light. It has been aptly said that "Light is not a thing in itself, but rather a condition of things." Light and color are merely sensations or illusions within the eye and the brain. We can see colors with our eyes shut, as when we press the eyeballs. When an electric shock is conveyed to the eyes, the person can see flashes of light in a dark room. Some drugs known to medical men produce the sensation of seeing colors where none exist.

These simple examples show that light and color are independent of outside light, and can be produced within the dark little chamber of the eye and the brain. It is with our brain we see colors.

ETHER WAVES.

All self-luminous bodies like the sun, the electric light, a lit candle or gas flame, etc., transmit to the surrounding ether an exceedingly rapid vibrating motion and this motion radiates in all directions as waves of energy. If a violin string be made to vibrate rapidly by drawing the bow across it, the vibrating string sets up a corresponding **vibration in the surrounding air. The rapidly pulsating** air reaches our ear and beats upon the ear-drum and becomes translated into what we term sound; and we hear a musical note.

In a similar manner the excessively rapid vibrations of the ether travel in the form of waves, and reach the retina of the eye; the pulsations become translated into **what we know as light. This hypothetical medium known to philosophers as the "ether" is assumed to pervade all** space and convey the energy in the form of vibrations, which throb from luminous objects, at the inconceivable speed of 186,000 miles per second. It is only when these dark waves of energy fall upon the delicate mechanism of the eye, that they become known to us as light and color; but how the stimulus they convey is translated into light is still a mystery. Science can not explain it. Some physicists hold that a chemical action is set up; others say it is electro-magnetic; possibly it is a combination of both. This theory that the etheric vibrations travel through space in the form of "waves," gives rise to the accepted "undulatory or wave-theory of light." It must be remembered that the ether itself does not travel, but simply the wave of energy. In a wave of the sea, it is the undulation that travels, not the water. As a graphic writer about the color and the beauty of the sea says,* "A ship on the surface of a swift-moving wave does not drive ahead. It merely rises as the wave passes under, and falls as it passes out and away. Undulation and advance are not the same things."

MUSIC AND COLOR.

There is a wonderful analogy between sound and light, and music and color; and the poetic saying that "Color is the music of light" is scientifically correct as well as beautifully expressed. The human ear is capable of hearing sound only when the air vibrations pulsate upon the ear drum at a speed within certain well defined limits. For example, if the air vibrates at 50 beats per second, we hear a very low, deep musical sound, but it is about the smallest number of beats per second that we can hear as sound. This produces the deep note of an organ. If the air vibrates at 45 per second we hear no sound; but if they be increased to 100 to 200 vibration, we hear the deep note of a bass singer.

From 300 up to 1,000 vibrations per second form a gradual ascending musical scale, a sound spectrum so to speak; and when the vibrations reach 6,000 or 8,000 per second, this is the shrillest sound the human ear can hear. It is similar to the shrill squeaking of the field mouse; beyond this the vibrations become inaudible. I have introduced the subject of sound and music to illustrate the subject of color, because the two are analogous; it must be remembered, however, that sound and music are *air* vibrations; while light and color are *ether* vibrations.

It may now be readily understood how the many different colors of the spectrum arise; how blue is different from red, and green from violet. As the rapidity of vibration, or what physicists term the "wave frequency" increases, we get a gradual ascending scale, from the deepest note of the organ to its highest tone. So, in ether vibration, the slowest "frequency" produces the sensation of seeing a *red* color, and a gradual increase in the vibratory speed gives us the sensations of seeing orange, yellow, green, then blue and lastly violet.

If the ether vibrates still more rapidly it is invisible to our eye. Although invisible to our sense of sight, the photographic plate is affected by these rapid etheric vibrations, or "chemical rays;" and this gives rise to the beautiful art of photography.

As philosophers have been able by means of experiment to discover the number of air vibrations to produce a certain given musical note, so they have likewise been able to calculate the number of etheric vibrations necessary to produce the sensation of seeing the different colors of the spectrum. And the result is marvelous. The vibrations that produce the sensation of red light vibrate at four

*"The Opal Sea," by John C. Van Dyke.

hundred billion times per second. (400,000,000,000,000.*) If the vibrations increase to four hundred and fifty billions per second, an orange color is the result, and so on, a gradual increase of rapidity of vibration producing the color sensations of yellow, green and blue; and when they reach eight hundred billions per second, they produce a violet color. Beyond this they become invisible and extend up to somewhere like one thousand, six hundred billion vibrations, giving rise to the marvelous phenomena of X-ray photography and radium rays, etc.

THE THREE PURE COLORS.

All of the variety of vibrations from red to violet are present in ordinary daylight, and hence the infinite variety of colors to be seen in nature. It was long held that all of the spectrum colors obtained by passing light through a prism were all pure, or homogeneous colors; but later investigation has revealed the fact that there seems to be only three perfectly pure color sensations, namely red, green, and blue. The other colors, orange, yellow and violet, can be produced by combining the lights of these three pure or "primary" colors.

This red, green, and blue theory was first elaborated by Dr. Thomas Young, in 1802, but his researches received no attention until they were brought to light again many years after by Professor Helmholtz, the eminent German scientist and Prof. Clerk-Maxwell. This theory has now been generally adopted by scientific men, and is known as the Young-Helmholtz theory of color sensation. But it is one thing to work with colored *lights*, and quite another to work with *dyes* and *pigments*. Owing to the difference in the purity and constitution of these two classes of colors, viz., lights and dyes, it was found that the so-called primary colors of the scientist had to be different from those of the practical worker, like the painter and the dyer.

From early times, red, *yellow* and blue have been looked upon as the pure colors, unattainable by mixture, and as these were established as a theory by an eminent philosopher Sir David Brewster, they go by the name of the "Brewster theory" of color primaries. The scientist produces yellow by combining red and green lights, but the practical worker, not having optically pure colors at his disposal, has to content himself by considering yellow a primary color. Some of the different results of the two methods may be given as follows:

COLORS COMBINED.	AS COLORED LIGHTS	AS DYES AND PAINTS
Purple and Green ..	Grey	..Sage Green
Violet and Yellow ..	Yellowish White	..Dull Sage or Plum
Green and Red	Yellow	..Grey or Black
Red and Yellow Green	Light Pink	..Terra Cotta
Yellow and Blue ...	White	..Green
Orange and Violet ..	Light Bluish Pink ..	..Dull Crimson

A considerable amount of misunderstanding and confusion has arisen in the minds of beginners between the two theories; but it is well to remember that they are based on two different principles. In the mixing of colored lights, either by super-imposing one light upon another, or by rotating the colors on a rapidly revolving color-disc, the result is a matter of addition, whereas in combining dyes in the dye bath, the result is a question of subtraction. One dye absorbs or counteracts the other, to a certain extent, producing grey or darkness.

*The British system of counting a billion is a million of millions, and not a thousand of millions as in the French and United States system of numbering.

COLOR VISION.

It is unnecessary here to enter into a detailed account of the structure of the eye, but it is well for the student of color to know a little at least of the more important facts relating to color vision. At the back of the eye is the delicate network of nerves called the retina, which corresponds to the photographic plate in a camera. Upon this retina is focussed, by means of the lens, everything we see; and the light impulses, beating upon the delicate retina, are carried to the brain by means of the optic nerve which acts like an electric cable. These mysterious impulses are then translated into what we know as light and color.

The retina, although no thicker than ordinary paper, is a marvelously complex structure consisting of no less than nine distinctly different layers of delicate nerves, each layer having its own function to perform in seeing. The most interesting nerves to the colorist are those termed the "rods," because they have blunted ends, and the "cones" because they are sharpened at the ends. It is supposed by physiologists that in this layer of "rod and cone" nerves, reside the power of perceiving light and colors. The "cones" or sharp-pointed nerves are understood to be the color-perceiving nerves, while the "rods" determine the amount of light and darkness. It is an interesting fact that nocturnal animals and others that live away from the light, such as the bat, mole, owl, etc., have no color-sense, as the color nerves are absent from the retina of their eyes.

An interesting property of the human eye and one of importance to colorists, is that of seeing what are termed "after images." If we look steadily at some brightly colored object for a minute or two, and then quickly turn our eyes to a white sheet of paper, we see an image or impression of the object, but appearing in quite different colors. This experiment is familiar to every reader and though simple is most instructive. If, for example, we put a small red piece of paper on a white sheet, and gaze at it for a few seconds, and then remove the red paper, keeping our eyes fixed on the white sheet of paper, a faint green image occupies the place where the red paper was.

If we take a yellow paper we find the after-image is a bluish tint. If we gaze intently on a green surface and then put on that surface a small piece of white or grey paper it gets tinged an orange color. The color of the image, is in all cases, the complementary of the other original color. These color phenomena can be readily explained by the Young-Helmholtz theory of color vision, and as they are of the utmost importance to all practical colorists and students of color contrast and harmony, I shall devote our next chapter to their consideration.

(To be Continued.)

The making of changes in piping or shafting or belt lines has caused many owners without experience in concrete buildings to decide against the material. This difficulty of cutting new holes through concrete floors or walls is not nearly so great as it seems on first thought. That concrete is hard to cut through is admitted, but that this is a serious fault is denied. Ordinarily where a man puts up a new mill or factory he has his machinery and shafting lay-out well in mind and generally he knows just where each machine is to be set. If this is so, provision can quite easily be made for any bolts or hangers before the concrete is cast.

ECONOMICAL MILL CONSTRUCTION.

PROGRESS IN MILL CONSTRUCTION. THE PILASTER DESIGN AND ITS ADVANTAGES.

(*Contributed exclusively to* COTTON.)

BY FRED S. HINDS.

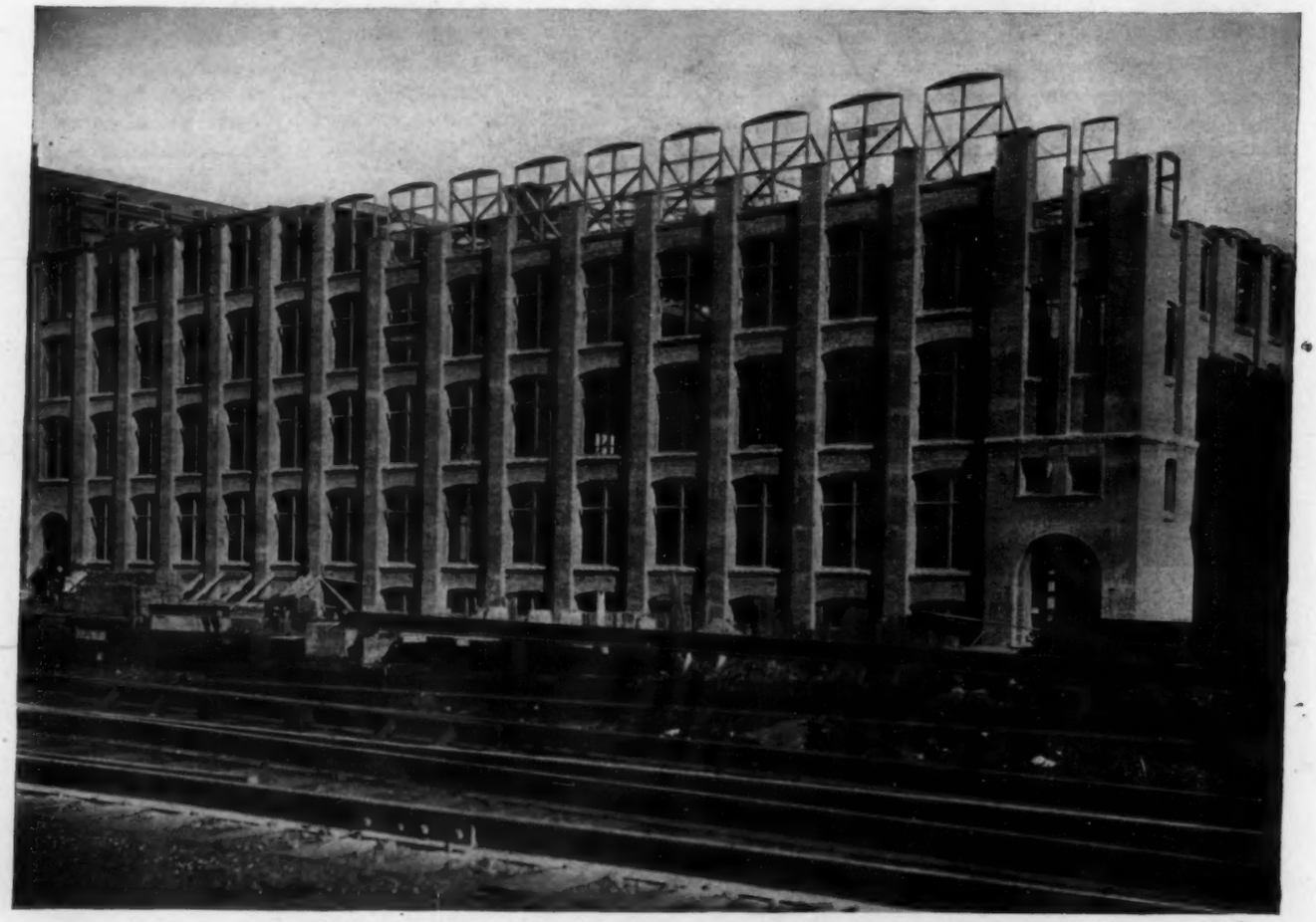
From the time that David Whitman, the first mill engineer of New England, started to improve the designs of textile mills down to the present day the form of construction has progressed beyond anything he could have dreamed of. The progress from narrow mills of 40 and 50 feet, first to 60 and 75 feet, then to 100 and 125 feet, and in some instances to 150 feet wide, has called for careful skill in the design of mill buildings.

The recognized value of larger window area and carrying out the principle of admitting light to the center of the building by the most advantageous methods have made this progress possible. First, the window lintel or arch head was moved higher up, and then to the floor plank above, thus allowing the light to penetrate further into the room. Then came the increased height of stories, with the resulting height of windows as the mills increased in width; and lastly the increase in width of windows and wider bays increasing from the older width of 8 feet to that of 10 feet and in some instances to 11 and 12 feet. These latter widths, however, are only for one-story mills.

THE PILASTER DESIGN.

A specimen of economical mill construction is shown in the accompanying illustration. A saving of 10 per cent. in the cost of foundation and brick walls is made by the pilaster design shown, over that of a plain wall design. A larger window width and area is also obtained than is possible in a plain wall type. The brick construction illustrated shows the front wall of the mill in process of construction, and very clearly illustrates the pilaster design and so-called "curtain wall" or panels between. It will be noted in this pilaster design that the lines of pilasters and window jambs are identical, thus reducing the amount of corners to be laid in the brickwork with the resulting economy in cost.

The real economy, however, is in the reduced thickness of walls and narrow pilasters, and consequently lighter foundations. This mill is to be five stories and has a wall thickness through the pilasters of only 28 inches in the first story, with a bay of 10 feet and 4 inches, and window 8 feet wide; it gives a pilaster width of only 28 inches.



INCOMPLETED MILL, SHOWING THE PILASTER DESIGN.

By special treatment of the rear wall, which at the same time preserves the same width of window, the usual vibration in mill buildings is resisted, to even a greater degree than with plain thick walls. On referring again to the illustration it will be noticed that the horizontal brick work between window arches and window sills is materially reduced when compared with the amount used in a plain

wall design. Again, economy is obtained by the thin brick arches of the 12-inch curtain wall, compared to the cost of laying arches in thick walls.

ADVANTAGES OF THIS DESIGN.

This design admits of 70 per cent. of the gross wall area in glass and is a striking feature when compared with some of the heavy mill walls so often seen in the South. The windows in the basement story of the mill are glazed with prismatic glass, making this one of the best lighted cotton mill basements in New England.

The increased cost of brick work, resulting from shorter hours and increased wages of bricklayers, makes it imperative that the amount of brick work laid be reduced to a minimum, consistent with substantial construction. This new style of construction has many advantages which may be summarized as follows: First, considerably lighter constructed foundations; second, a large percentage of saving in brick work; third, increased window area, thus insuring better lighted rooms; and lastly a saving of at least 10 per cent. in the cost of mill buildings, over that of the plain thick walls and the thick window arches, the arches being the most expensive part of the brick work.

BUILDING DESCRIPTION.

The main stairway of this mill occupies the tower, which encloses it entirely between brick walls, and is pierced at each landing by doorways, protected by automatic fire doors. This, with the old stairway of No. 1 mill, furnishes means of egress at each end in case of fire. The more hazardous departments of the mill, together with the power plant, are completely enclosed by fireproof partitions and ceilings of plaster on metal lathing, pierced where necessary by windows, glazed with wired glass. The boiler room and coal pocket, which occupy the northern end of the basement story, are constructed entirely of steel frame, thoroughly fireproofed, with reinforced cinder concrete ceilings and concrete floors. The tower has a 5,000-gallon tank, located in the top story, for use of the dye house. The dye house has a clear span of 30 feet and is roofed with slate and heavy ribbed glass skylight on steel trusses, making a very well lighted room. A system of ventilation was a special feature for removing steam from the dye house and is operating most successfully.

CONVENTION AND EXHIBITION OF THE NATIONAL ASSOCIATION OF HOSIERY AND UNDERWEAR MANUFACTURERS.

The sixth annual convention and fifth annual exhibition of the National Association of Hosiery and Underwear Manufacturers will be held in Philadelphia, Pa., May 16 to 20, 1910. The membership of the association has grown materially since the last convention and exhibition, and indications point to a much larger growth before the convention in May. Secretary C. B. Carter states that the exhibition will be a very large one and that space is being reserved very rapidly. The exhibition is one of the important features, and always proves of interest and value to the visiting knit goods manufacturers who are thus enabled to examine all improvements and new devices that are related to their business.

THE LEGAL RELATION EXISTING BETWEEN MILL AND SELLING AGENT.*

BY WALTER S. NEWHOUSE.

The various kinds of agents may be classified as follows:

1. The selling agent who sells his principal's goods on a strictly commission basis and who has no responsibility in regard to the payment of the purchase price.

2. The factor who makes advances to the manufacturer up to a certain percentage of the value of the goods and who receives a commission for effecting their sale.

3. The "del credere" agent who may or may not make advances upon goods and who guarantees the payment of the price at which the goods are sold in consideration of an extra commission in addition to his compensation for selling.

For the purpose of convenience, the term "principal" will be used to designate the mill, and the term "agent" to designate the selling agent, whether the latter is merely a sales agent on commission, a factor or a "del credere" agent. To whatever class the "agent" may belong, his first and main duty and obligation is to obey implicitly the instructions of his "principal." If he departs from such instructions, he is responsible to the "principal" for any loss that may accrue thereby.

The usages of trade, however, determine in a large measure what the powers of the agent are in the absence of specific instructions to the contrary, and the "agent" is protected if he sells in accordance therewith even if the "principal" is ignorant of the usage, provided the same is general and uniformly acquiesced in by the merchants of the particular locality where the goods are sold. For instance, in the absence of instructions, the "agent" may sell upon reasonable terms of credit and where goods are so sold, the "agent" has implied authority to receive payment therefor and if he make reasonable inquiry as to the financial standing of the purchaser, he is not responsible to his "principal" for any loss which may accrue to the latter on account of the insolvency of the purchaser.

Where a sale of goods has once been effected by the "agent," it is not within his power to consent to a cancellation of the order, his authority being limited to selling the goods of his "principal." This is the case no matter to which of the three classes of selling agencies named the agent belongs. It is believed, however, that this rule is "more honored in the breach than in the observance," and it is apparently a matter of daily practice for commission houses to consent to a cancellation of an order without even consulting with their "principal" the mill; if this practice were not so universal, there would in all probability be less canceling of orders; presumably the authority or right of the commission house so to do has not been questioned and that this is the reason for the practice; but if the commission house when requested to consent to a cancellation of the order by the purchaser would reply that it is not within its power so to do, it would, it is believed, be often relieved from what might be an embarrassing position.

If the mill warrants the quality of the goods to the "agent," the latter is justified in selling them with such a warranty and if the goods are not as warranted and a claim is made against him by the purchaser, the "agent,"

*Delivered before the National Association of Cotton Manufacturers.

if he is compelled to compensate the purchaser, may recover from his "principal" the sum so paid; where, however, the "principal" merely consigns the goods to the agent without any representation as to quality and the "agent" in selling them warrants the goods, he can not when called to account by the purchaser on his warranty escape liability on the ground that he was merely a selling agent, and that the purchaser was aware of this fact; the representation will be considered his and not that of his "principal," the mill.

One of the chief duties of the "agent" is to keep his "principal" fully advised as to all facts relating to the consignment which may be of use or benefit to his "principal" or which would enable the "principal" to take prompt measures to protect his interests. For instance, it is the duty of the "agent" to give the name of the purchaser of the goods to the "principal;" to notify him of any information which may come to him in regard to the financial condition of the purchaser, and to keep him generally posted as to the condition of the market, and for failure so to do the agent may be held responsible.

This duty of the agent to advise the principal as to the name of the purchaser is well exemplified in a case recently brought to the attention of the writer where the "del credere" agent (who guaranteed payment on the part of the purchaser) notified a cotton mill in the South that it had taken an order from a customer for a large quantity of cotton goods. Upon receipt of the order the mill purchased cotton to fill the same and at once began the manufacture of the goods and had about half of them made up when it received advices from the agent that the purchaser declined to receive any of the goods. The mill then demanded from the agent the name of the purchaser which information the agent declined to give.

As the liability of the "del credere" agent is to guarantee the payment of the goods and does not include the obligation to compel the purchaser to accept, the mill could not sue the agent on any guarantee as none of the goods had been delivered, nor could it sue the ultimate purchaser whose name was unknown to it, and therefore, the only remedy which the mill had was to bring suit against the "agent" for damages sustained on account of his failure to perform one of his chief duties, viz.: to act in perfect good faith to his "principal" and to advise him of the name of the purchaser and as to all other facts which would enable the principal to protect his rights.

A question often arises as to the right of the agent to receive commissions on goods sold by him where the sale has been rescinded by acquiescence and agreement between the principal and the ultimate purchaser. This is an instance where the right of the agent is determined to a large extent by the usage of the trade. Strictly speaking, the agent has earned his commission as soon as he has effected the sale and brought to his principal a purchaser who is ready, willing, and able to buy the "principal's" goods. The practice, however, as determined by the usage of merchants seems to be that the "agent" is not entitled to his commission unless the purchaser actually receives the goods.

Similarly where sales are made on credit and a loss occurs to the principal on account of the insolvency of the ultimate purchaser, the agent will or will not be entitled to his commissions in accordance with the custom and usage of the trade or in accordance with his particular agreement with the "principal." The commission house of the present day, through which most of the sales of merchandise are effected, usually combines the functions of both factor and "edl credere" agent, that is to say, it both makes advances upon the goods and guarantees the payment of the purchase price when the goods are delivered to the ultimate purchaser.

Although the commission house or "del credere" agent has responsibilities and rights beyond those of the ordinary selling agent, yet it must be borne in mind that it is in effect as between itself and the mill only an "agent" and bound as such to follow the instructions of the principal.

In return for the additional liability the commission house has corresponding advantages: thus, it is entitled to retain possession of goods consigned and their proceeds, to protect its lien for advances, and to collect and sue in its own name for the recovery of the price of the "principal's" goods which it has sold. These are rights of which the "agent" can not be deprived except by reimbursing him for his advances or in case of a "del credere" factor by relieving him from his guarantee.

Although the factor presumably looks to the goods themselves to reimburse him, having made his advances upon his estimate of their value, that fact does not deprive him of the right to look to his "principal" where the goods are sold and the proceeds realized therefrom are insufficient to repay his advances, and while ordinarily an "agent" may only sell goods in accordance with the instructions of his "principal," a factor who has made advances may sell without such instructions, or even in violation thereof, for the purpose of reimbursing himself, where the "principal" after reasonable notice and demand has failed to repay the advances made.

Where the consignment is made by the "principal" without instructions as to the price at which the goods are to be sold and the factor has made advances thereon, he may sell in such a manner and at such a time as the usages of the business permit, and the consignor has not any power by subsequent order to suspend or control this right of sale; but where the factor sells without his "principal's" instructions he can sell only so much of the goods as will enable him to recover his advances and his commissions.

In cases where the factor has made advances on goods, but has not guaranteed their sale, the question often arises when the goods have been sold, whether the factor can recover the amount of his advances from the "principal" before payment thereof is due from the purchaser, and on this point the authorities differ. In some States it has been held that the factor can at any time demand the repayment by the "principal" of his advances, but in New York the courts have determined that the factor must wait until the purchaser fails to pay before he can look to the "principal" to reimburse him for his advances. This would seem to be the reasonable construction as the advances are made primarily upon the goods and only secondarily upon the credit of the "principal."

RIGHTS OF "PRINCIPAL" AND "AGENT" AGAINST THE PURCHASER.

Where the purchaser has cancelled his order and there is an enforceable contract against him, the question at once presents itself as to who shall bring the action, whether the mill or the "agent," and the writer has found the impression almost uniform that such a suit must be brought by and in the name of the "agent" and that the mill has no right or interest in the transaction. But the mill on consignment of its goods to the factor always re-

tains the right to enforce the payment for the purchase price of the goods. The consignor upon a consignment of goods to be sold on commission does not part with his title to the consignment, but he continues to be a part owner of the consigned property, and the rule is the same whether the consignee is a "del credere" agent or makes advances to his "principal" or is simply an agent for sale. The mere fact that the purchaser may or may not have ever known the name of the mill manufacturing the goods is immaterial. The mill as undisclosed principal may bring the action, as the title of the goods remains in it subject only to the lien of the factor.

In the case of "del credere" agency the mill at the expiration of the term of credit at which the goods were sold may at its option sue either the "del credere" agent or the ultimate purchaser for the purchase price, and this right is inherent in the mill at all stages of the transaction before it has received pay for the goods either from the purchaser or from the "del credere" agent, and the mere fact that the goods have been charged up by the mill to the commission house does not of itself take away from the mill the right to sue the ultimate purchaser in its own name. By so doing, however, the mill releases the factor from his guarantee if he be a "del credere" agent, for it takes away from the latter the right which he has to sue the purchaser for the purchase price. As soon as the mill becomes known as principal, the right of the factor to receive payment for the goods ceases, and the purchaser who after such knowledge chooses to deal with the factor does so at his own risk.

Although as has been seen, the mill has the right to sue the ultimate purchaser for the price of the goods; the factor who has made advances and the "del credere" agent who has guaranteed sales have an equal right so to do, and it is well established that such an action can be brought by the factor in his own name.

On the other hand, the purchaser, in case the goods were not in accordance with contract or in case of failure to deliver within the period contracted for, has the undoubted right to sue the factor in whose name the goods have been sold, or he may at his option sue the mill, the undisclosed "principal" in the transaction, for damages sustained on account of the failure to deliver.

Where goods have been sold in the name of the factor and suit thereon has been brought by the mill against the purchaser, the latter may offset in such a suit any claim which he has against the factor, and if suit is brought in the name of the factor, the purchaser may offset therein any claim which he has against the mill, the undisclosed "principal."

As long as the factor is the only person known to the purchaser the latter may look to him as his "principal," but as soon as the factor notifies the purchaser of the name of the mill, the undisclosed "principal," at that moment his liability as "principal" for future transactions ceases, and the purchaser will be deemed to be dealing with the mill direct.

If the factor therefore desires to protect himself in his dealings with the purchaser, he must in each instance before the sale is made, make known the name of his "principal." So in cases where the mill can not make deliveries, the factor will be personally held responsible to the purchaser for such failure unless he has made known the name of the mill manufacturing the goods.

It seems to be the belief among commission merchants that if they describe themselves on their circulars and billheads as such, or as "selling agents" that by so doing they are relieved from responsibility to the purchaser—such is not the case—they are still liable to the ultimate purchaser as "principal" unless they fully disclose in each instance the name of the manufacturing mill; they can not have the advantage of acting as principal in a transaction without the corresponding liability.

BOTANY WOOL COMBING MILL.

All initial difficulties have been overcome, and wool tops are now manufactured for export at the Botany Combing Mill of F. W. Hughes, Ltd. The difficulties were considerable, but the success in making tops fully equal, if not superior, to the tops manufactured in the United Kingdom on the Continent, or United States is ample compensation for initial troubles inseparable from any great undertaking. With wool at first hand, an excellent water supply, a clear atmosphere, warm climate, and combing machinery of the very latest type, an excellent product would naturally

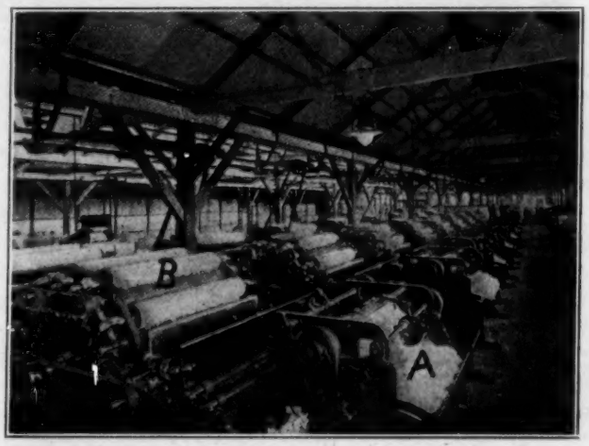


FIG. 1. WOOL CARDING MACHINES.

be expected. But there were many prejudices and obstacles to be overcome. However, coming at a time when the wool position is so strong and tops materially advancing in price, the reception accorded the splendid samples manufactured at Botany, New South Wales, bids fair to lay the foundation of the wool-combing industry in Australia upon a firm basis. So excellent have been the parcels of tops shipped, that the output of the mill has been sold three months ahead.

For many years past, woolen fabrics have been produced at the various mills in Australia, and, more recently, worsted fabrics. Thus, wool has been manufactured into fabrics practically at the seat of production. The woolen mills have combined the various processes for treating raw wool and producing cloth for the tailor; but that system is not in vogue in the leading woolen textile countries of the world. There are several main branches of the industry, and each one is specialized to the highest degree of efficiency. Combing, spinning, and weaving are carried on, quite apart from the other. The woolcombers supply tops to the spinners, as the commercial standard and unit of the wool business; the spinners produce yarn for the weavers; and the weavers manufacture the infinite variety of the worsted and woolen fabrics for the people of the earth.

It can thus be seen that wool, when combed, becomes

practically a standard from which there are only minor departures. Such, for instance, as the 60's of one firm may be of so good a quality that it may be equal to the 64's of another comber. For all practical purposes, however, the various counts—such as 60's, 64's, etc., indicate the spinning qualities. That is to say, that according to

FIG. 2 GILLING MACHINES.

the fineness or coarseness of the combed wool, so will it spin out to a greater or less length. One pound of 74 tops will spin 74 hanks 560 yards in length, as against one pound of 40 tops that will spin 40 hanks 560 yards in length. A coarse, crossbred wool is, say, double the thickness in the fiber of a fine hair merino; therefore, 16 ounces of such fibers would only extend half the length that a similar weight of fine merino would. Once understanding the meaning of tops, and why the qualities (length to which they will spin) are known as counts, then the comprehension of the processes of transforming wool into tops becomes comparatively easy.

The first stage of all is sorting. Although wool is classed on a station, it is not sufficiently classed for the woolcomber, for when a bale of fleece is turned out on the sorting tables of a combing mill, this bale will yield three and sometimes four qualities. When a sufficient quantity of wool is ready to spin a 60's, 64's 70's 74's or higher top as the case may be, the wool is scoured. It is then ready for the various machines that constitute the plant of a combing mill.

The accompanying illustrations depict three sets of machines, all of which are designed for combing fine or merino wool. By certain alterations, however, they could be made to comb come back or medium crossbred wool—say, 46's or 50's tops, or even coarse crossbreds down to 36's. The view of the carding machines, as illustrated in Fig. 1, shows the receiving ends of the machines, with the troughs of scoured wool ready to be treated; or, to be more explicit, the end A of the machine shown is the trough of an automatic burring attachment to the carding machine. The attachment cuts and shreds the burr and seed in the wool, throws out the refuse; weighs the necessary quantity of wool (all automatic) and passes it on to the double worsted carding machine B. The model of this burring attachment patent was purchased seven or eight years ago for nearly $5,000,000 which gives some idea of its value. As an adjunct to the carding machine, it is invaluable, and forms a magnificently complete operation.

The double worsted carding-machine comprises several cylinders and a series of rollers of various diameters. They are all covered with steel teeth for teazing out the wool. One of the cylinders is 5½ feet in diameter. In each pair of rollers working over the cylinders, one roller is larger than the other—one is called the "worker" and the other the "stripper." The worker tears the wool off the revolving card and the stripper strings out the wool. This stringing out of the wool is the first appearance of it in a connected form, very crude at first, but destined to pass on into a beautifully lustrous ball even before the last stage of combing is reached.

The carded wool is cut off the last cylinder of the machine by a saw-like knife and then passes in the form of a web to a traveling apron. The eight carding machines in a row pour forth eight webs of wool, and may be likened unto eight streams all pouring into one channel. They discharge a band of wool about nine inches in width on to the one conveyor that delivers them all as one combined band to the balling machine. The balling machine simply winds the band, after narrowing it into a ball about 18 inches x 12 inches. From the entrance of the wool into the burring attachment of the carding machine until it leaves the balling machine, there is no handling of the wool. All that is required is that the machines shall be fed with scoured wool and the ball of wool removed when wound to the proper length.

From the balling machine the balls of carded wool are placed in the receiving boxes until it is necessary to feed the gilling machines, of which there are three sets. In the illustration Fig. 2, which shows the gilling machines, the wool balls C may be seen at the rear of each, all in the process of being unwound, preparatory to passing through another stage that will terminate in a ball of greater fineness and condensation. The gilling machine receives the carded ball, unwinds it, condenses it, and lays the fibers more or less parallel to each other. This machine acts more gently than the carder. Twelve carded balls are transformed by gilling into three balls. These balls of wool are then taken from the machine and placed in the rear of the second gilling machines, where the teeth on the rollers are

FIG. 3. COMBING MACHINES.

finer. The fibers passing through them become still more parallel. No fewer than 24 balls from the first giller are placed on the second. It is all one continuous process of

combing from coarse to fine combs. On the third gilling machine, 18 balls are condensed into six balls, and as the sliver is wound on to the ball, a little twist is given to it.

Now the balls of wool from the gilling machines are ready for the combing machines shown in Fig. 3. There are eleven combing machines at the Botany Mill, and 24 balls are placed on each machine. The combing machine renders the fibers still more parallel, it eliminates all impurities—such as seed burr remnants remaining from the previous process, sets right any entanglements, and frees any loose fibers due to shearers' second cuts (which governs the percentage of noils). It condenses several ribands into one band, keeps giving the wool a pull, and reduces its elasticity,

FIG. 4. BACKWASHING MACHINES.

as well as combing it into the slivers or ropes. Instead of the wool from the combing machine being wound into a ball, it is received into circular cans about 2½ feet high and 9 inches in diameter. The contents of these cans from the combs are gilled, 12 strands being converted into one riband.

However, the process is not yet complete. 20 balls are placed on a backwashing machine as shown in Fig. 4 and the strands of wool pass through a soapy warm liquor, then over copper rollers that squeeze the liquor out. The strands then pass into a less soapy warm bath for a rinse and through squeezing rollers pulled with steam for the purpose of drying. The strands are thus evenly flattened out, and appear like wrappings of pure white flannel over the copper steam-heated rollers.

The wool leaves the backwashing machine in four ribbons that are rolled into balls. The last process of all is the finishing gilling machine. Here the final condensation takes place over finely smoothed rollers. All that is necessary is to condense eight ribbons of wool into one long coil, and impart a lustre to it as it is balled into a top for the spinner. In the case under review a 74's top was being made for Japan. The ball was about 20 pounds in weight, and wrapped neatly in brown paper, with a ticket with date and quality. Twenty balls go to a bale of about 400 pounds net.

The by-product of the combing mill is noils or short fibers that are thrown out by the carding and combing machines. The machines are worked by electricity, and the mill at night is provided with electric light. At present about 1,400 pounds tops are produced in eight hours, and about one million pounds weight can be turned out per annum, absorbing about 7,500 bales wool in the grease. It is proposed to add to the plant as soon as the machinery can be imported, thus by the end of the year the mill will be capable of producing three million pounds weight of tops using 22,500 bales of wool per annum.—DALGETY'S REVIEW.

FIRING AND COMBUSTION.

BY E. L. PENRUDOCKE, M. E.

Since the fireman is largely responsible for the quality of combustion, we will consider the methods of firing that usually yield the best results.

The thickness of the fire and its distribution on the grate should be regulated by the size and quality of the fire, force of the draft, and the admission of air. When good sized coal is used, containing small quantities of hydrocarbons, sufficient air with a good natural draft will pass through the fire, provided it does not exceed eight inches in thickness, but with forced draft it may be thicker.

With careful firing and the proper admission of air, most coals can be burned without much smoke. The best mode of firing a smoky coal is to pile the fresh coal toward the front of the fire, when the volatile matter will be driven off by the incandescent coals. This matter, mixing with the air, ignites and passes over the fire and is consumed, while the mass in front is gradually converted into coke and is pushed back over the fire at the next charge and is burned by the air passing through the bars. This method will give the most economical results, but not the most rapid evaporation.

The fire should be charged every twenty minutes. If, however, the coal cakes, regular firing with moderate amounts every ten or fifteen minutes is better. When there are two furnace doors, it is better to fire alternately first one side and then the other at regular intervals, as in this way one side of the fire will be bright, and will not cool the whole furnace at once.

In using small sizes and slack coal, the gases are instantly disengaged when the charge is placed upon a hot fire, and is liable to cause a poor mixture with the air. To prevent smoke when using slack without wetting it, fire continuously with small charges. This will give a better opportunity for the gases to mix with the air. However, the frequent opening of the fire door is likely to cool the furnace and check the evaporation, and unless there is ample boiler capacity this method can not be recommended, as it is not economical. The most economical method of firing slack coal is by means of a mechanical stoker.

Some objections are raised against mechanical stokers, such as the firing being steady and evaporation consequently uniform, because where the load is variable, it is liable to cause low steam pressure at times when full pressure is desired. Another objection is that the rate of evaporation is less than with hand firing, but this can be overcome usually by a modification in the furnace, and by regulating the feed and thickness of the fire.

With good coal, hand firing is without doubt the best, both in regard to rapid evaporation and economy of fuel, and with a little skill, smoke can be prevented when the boiler capacity is sufficient. The grate bars should have openings of not less than six square inches per square foot of grate surface.

Admission of air above the fire is of doubtful value, but with slack coal, the gases are immediately driven off from the fresh charge and the admission of air above the fire will insure a better mixture with the gases. After the gases are driven off, it is liable to have a cooling effect and a loss of heat. This would apply particularly to the spreading method, as with that method the gases escape quickest.

With the coking method, the hydro-carbons are driven off slower and the admission of air is necessary. The most desirable way, except with the coking method is to admit air for a few minutes and until the hydro-carbons are expelled. With the coking method allow a small amount to enter above the fire constantly. Many object to this plan, as the rate of evaporation is diminished, although smoke is prevented, and, of course, it is better suited to stationary boilers than to locomotives.

The greatest difficulty in smoke prevention is, that many boiler plants are overloaded, and the admission of air above the fire in sufficient quantity to prevent smoke reduces the required evaporation. Boilers working under such conditions are wasting fuel, and although the evaporation may be sufficient it is not an economical practice. This applies chiefly to the return tubular and some water tube boilers.

The most effective boilers are what may be termed the two-pass water tube boilers. With these there is sufficient time given for complete combustion. Smoke prevention with the average boiler is rather a doubtful problem, but there is no doubt but that it should be attempted at least from a fuel saving standpoint.

Oftentimes a change in the length of the grates will bring economy in evaporation, but if they are six feet or longer it is almost certain to produce waste, as the grate is then too long to be controlled by the fireman. From 48 to 60 inches is the best length for a grate. A large grate will raise steam quicker by burning more fuel, but the increase in evaporation is not in proportion to the increase in fuel consumed. As a matter of fact, the shorter the grate the more economical it is of fuel. The economical limit in shortening the grate is fixed by the ability to generate sufficient steam without having to force the fire.

It is sometimes found that the difficulty in keeping a large grate covered increases so rapidly, with an increase in the force of the draft, that the production of steam is reduced, owing to the quantity of air passing through part of the grate, and this increases more rapidly than the heat generated on the remainder of the grate. The reduction of the grate area or the force of the draft will then give rapid evaporation and more economical results.

Height of grate should also be considered, and varies with the size of the boiler. From 20 to 27 inches, from the grate bars to the bottom of the boiler, is the minimum distance, while an average of 14 to 16 inches between the top of the fire and bottom of the boiler is a fair average height for return tubular boilers. With boilers equipped with Dutch oven furnaces it is a different proposition.

By increasing the distance too much, a large amount of radiant heat from the fire is lost, and by bringing the fire too close to the boiler it is liable to burn the plates, check combustion, and cause smoke. It is best to be governed by the kind of coal used and by trying different heights of grates and areas; also by consulting different plants and noting the conditions, from which many valuable hints can be obtained.

Smoke may be largely prevented by bringing a supply of air in contact with the flame, at which temperature the carbon combines with the oxygen. Careful attention to firing will bring about marked results for the better. Some may say this is all theory, and it can not be done at our plant, but if theory and practice are worked together, it is astonishing what good results can be obtained at little cost, and often at no cost whatever.

Keep the grates clean and do not allow the back end of the setting to fill up with ashes, but allow room for the combustion of the gases after they leave the furnace. Keep the tubes clean in tubular boilers, and in water tube boilers the tubes should be blown off daily with a jet of steam. On wash-out days, run the tube auger through the tubes so that a troublesome amount of scale will not accumulate. Keep all cracks in the brick work stopped and have good fitting fire doors and clean out doors. If there is a damper in the stack, keep it in working order and use it when necessary to check or increase the draft. All of these points, if attended to, will give better results.

DEFINITION OF A KILOWATT.

Electricity is measured by the kilowatt hour. The rates for buying current from the electric light plant for power, light or heat, or for charging the electric runabout, are always so much for each kilowatt hour of electricity consumed. This is just so much Greek to the average man and if you tell him a kilowatt is one and one-third horse-power he will only get a faint idea of what it is all about.

To explain the term requires first, a clear definition, and then a comparison. Everyone will understand that a certain amount of force must be used to drive electric current through a circuit. This force is measured by volts; thus we have 110-volt currents and 220-volts currents, the one expressing just twice the force of the other; but the quantity of current passing through a circuit depends upon the force and the resistance, and so the quantity is expressed by a different term, viz., "amperes." Now the efficiency of the current depends upon both force and quantity, and to express this efficiency or united action we multiply the force by the quantity—that is, the volts by the amperes and express the results in watts. Thus, 110 volts multiplied by 5 amperes is 550 watts, or 220 volts multiplied by 5 amperes is 1,100 watts. A kilowatt is, of course, 1,000 watts, which is the equivalent of about 1⅓ horse-power.

In charging a battery the lighting companies bill for the use of so many watts for so many hours—thus, 1,000 watts for 10 hours would be charged as 10 kilowatt hours, which, at 5 cents a kilowatt hour, would be 50 cents, a charge that seems little enough for 10 hours' use of 1⅓ horse-power. But what a kilowatt hour is worth may be judged by what it will do. Thus a kilowatt hour, figures an engineer of the General Electric Co. will light twenty 16-candle-power incandescent lamps or two standard arc lamps for one hour; it will pump 100 gallons of water to a height of 25 feet; compress 470 cubic feet of free air 100 pounds; drive an ordinary passenger elevator 175 feet; print 2,500 circulars on a 15 by 21 job press, or 1,000 sheets on a 32 by 47 cylinder press; run a sewing machine for two hours; supply air for a church organ for one service; mix 2½ cubic yards of concrete; heat a quart chafing dish for four hours; mix sufficient dough for 150 loaves of bread, and grind 600 pounds of coffee; it will drive a runabout 4½ miles or a three-ton truck one mile.—SELECTED.

COTTON MANUFACTURING

TERRY WEAVING AND ORNAMENTATION.

LOOSE REED TERRY WEAVING—ANALYSIS OF THE FORMATION OF LOOP FACED FABRICS—DESIGNS FOR ALL STYLES OF TERRY CLOTHS—TERRY MOTION ON A LOOM—TERRY ORNAMENTATION.

(*Contributed exclusively to* COTTON.)
BY WILLIAM WATSON.

Terry weaving is employed in the production of a class of warp pile fabrics in which certain warp threads form loops or curls on the face of the cloth. Only one kind of filling may be used, but two series of warp threads, placed on separate beams, are necessary for the production of these fabrics. The two series are the ground threads and pile threads, the former producing with the filling a foundation texture from which the loops, formed by the pile threads, project.

This looped or terry pile may be formed in two ways: (1) By inserting a wire (instead of a pick of filling) at intervals in a special shed on which only those threads are raised that have to form the pile; the subsequent withdrawal of the wires leaves pile loops standing vertically from the upper surface of the ground cloth. (2) By using a special reed-motion and warp-easing arrangement, by which loops may be formed on the upper, or lower, or both upper and lower surfaces of the cloth.

The first method produces a more regular and uniform

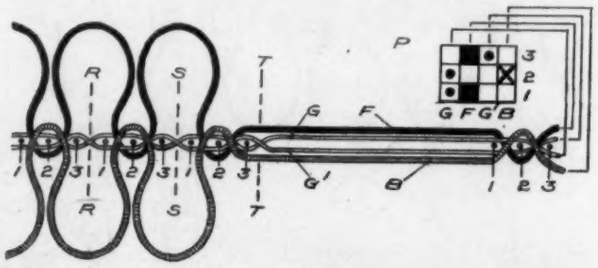


FIG. 1. DIAGRAM SHOWING FORMATION OF DOUBLE PILE FABRIC.

pile, and is employed for the best classes of terry fabrics; as for instance, certain kinds of carpets, upholstery cloths, and mantles. The second method, which will be considered in this series, produces a class of terry pile fabrics which are chiefly represented by the "turkish toweling" structure, and are generally made in either cotton or linen yarns. The same structure is used, in addition to towels, for making such fabrics as counterpanes, mats, dressing gowns, and toiletings. The principle has also been employed in the manufacture of cheap mantle cloths in which the pile is developed in yarns made from wool.

In forming the looped pile without the aid of wires, many different kinds of terry motions are used, but in every case the object is to cause two succeeding picks of filling to be left a short distance from the fell of the cloth, and then to beat up these two picks along with the following pick.

Fig. 1 is a diagram of a longitudinal cross section of a double face plain pile fabric, showing the filling threads in their relation to the ground and pile warp threads. Referring to the diagram the dotted vertical line RR, SS, and TT divide the picks 1, 2 and 3 into repeating groups of three, line TT indicating the position of the fell of the cloth. At the right hand end of the diagram is represented, the

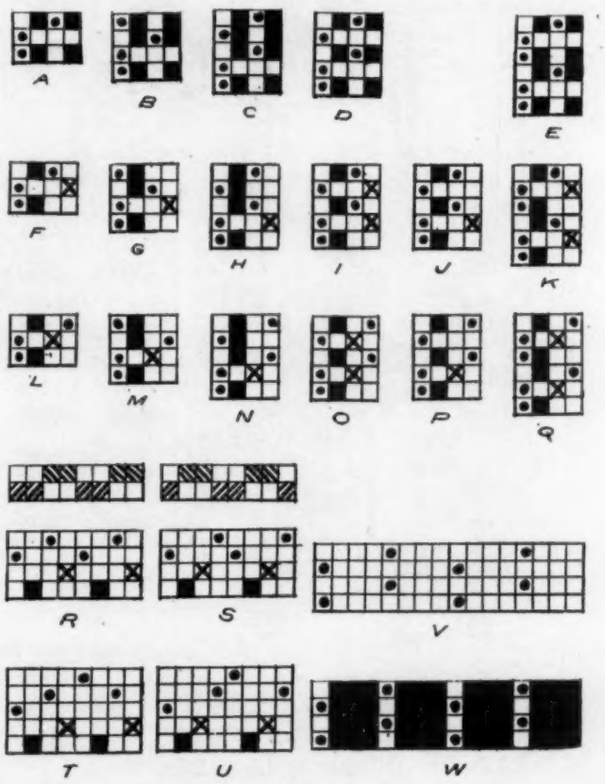


FIG. 2. MOTIVES FOR PRODUCING PILE FABRICS.

position of a group of three picks, composing a repeat, previous to being beaten up to the fell of the cloth. The warp threads G, G¹, F and B are shown connected by lines with the respective places in the corresponding weave design given at P. For weaving the fabric the ground warp beam, carrying the ground or binder threads G and G¹, is heavily tensioned so that said threads are held very tight all the time. The beam carrying the pile warp threads F and B is under very light tension. The picks of filling 1 and 2 are first woven into the proper sheds, but are not beaten up to the fell of the cloth by the slay at the time of insertion in their sheds. When the pick No. 3 is inserted, the slay is operated to beat the three picks into the cloth at the fell TT. During the beating up of the third pick 3 the pile warp threads F and B are either given in slack or are placed under very slight tension.

The picks 1 and 2 are in the same shed made by the tight ground warp threads G and G¹, which therefore offer no obstruction to the two picks being driven forward at the same time with the third pick. The pile threads F and B, on the other hand, change from one side of the cloth to the other between the picks 1 and 2, and they are therefore gripped at the point of contact with the filling threads 1 and 2. As the three picks are beaten up this point of con-

tact is moved forward to the fell of the cloth with the result that the slack pile warp threads are drawn forward, thus forming two horizontal rows of loops projecting from the cloth in the manner indicated.

In order to produce the loops on every three picks by using a terry motion, the pile and ground threads must be interwoven with the filling in the exact order represented in Fig. 1. The three-pick terry structure is employed most

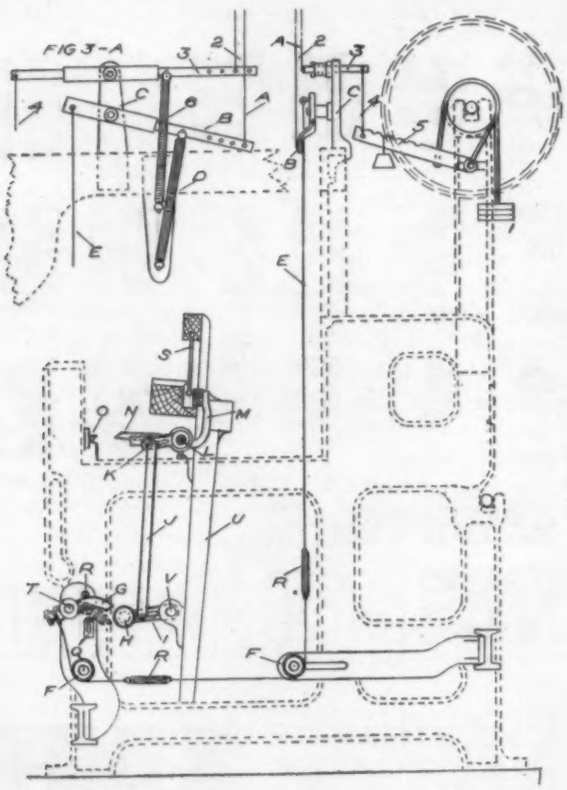


FIG. 3. DIAGRAM OF LOOSE REED MOTION.

extensively, but sometimes four, five and even six picks are inserted in making each horizontal row of loops. The interweaving of the threads, on the subsequent picks, is, however, of little consequence so long as the cloth has the necessary firmness, and a natural connection is made with the weave of the three picks particularly referred to.

A number of standard designs for producing pile fabrics are given in Fig. 2. These designs have been grouped so that comparisons can be readily made. The dots in the designs represent the interlacings of the ground warp threads; the full squares indicate the interlacings of the face pile threads, and the crosses show the interweaving of the back pile threads. Designs A, B, C, D and E form the loops uniformly on the face side of the cloth only, whereas the remaining designs are for producing a pile surface on both sides of the cloth.

In the designs F, G, H, I, J and K, the warp threads are arranged.

1 ground.
1 face pile.
1 ground.
1 back pile.

The warp threads in the designs L, M, N, O, P, and Q are arranged:

1 ground.
1 face pile.
1 back pile.
1 ground.

In the design A to E, there is a pile thread on the surface to each ground thread, but in the remaining designs F to Q, the proportion is one pile thread on each side of the cloth to two ground threads. The single faced pile cloths can, however, be made with one pile to two ground by leaving out the last thread in each of the designs A to E. The plans A, F and L are for producing the pile design on three picks; B, G and M on four picks, C, H, N, D, I, O, J and P on five picks, and E. K. and Q on six picks.

The five-pick effects, C, H and N, are respectively similar to D, I and O, except that the pile threads interweave more frequently in the latter three, while J and P show a further modification in which the face pile threads interweave more frequently than those which form the back pile. Less yarn can be introduced into the cloth with the more firmly interwoven designs, and at the same time the resulting structure is stronger and more durable.

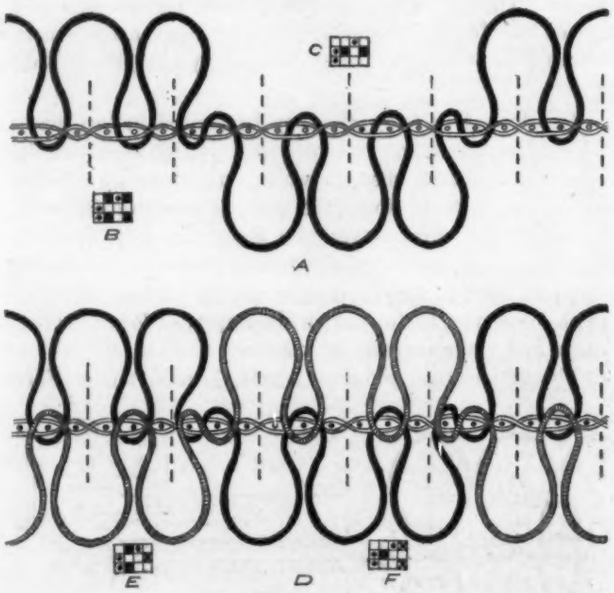


FIG. 4. DIAGRAM SHOWING TERRY ORNAMENTATION.

In the six-pick effects, E, K and Q, the threads interlace in exactly the same manner as in A, F and L respectively, but in producing the loops at every six picks, the filling is beaten up to the fell of the cloth on four picks in succession. This structure, which is known as the "Osman," is much firmer than the three-pick terry, on account of the greater number of intersections that are made for each horizontal row of loops; and with finer yarns and more picks per inch, the cloth is made very strong and durable.

Every plan in Fig. 2 is constructed for the first and second picks to remain back from the edge of the cloth, when they were first inserted and for the reed to beat up firmly all of the picks previously inserted, on the third and subsequent picks in the repeat. A comparison of the designs will show that in each case the interweaving of the respective threads is exactly the same on the picks 1, 2 and 3, and corresponds with the order of interlacing illustrated in Fig. 1. Thus, on the picks 1 and 2, the odd ground threads G are raised and the even ground threads G^1 depressed, while on the third pick they are in the reverse positions. The face pile threads F are raised on the picks 1 and 3, and

depressed on the second pick; the back pile threads B being operated in the reverse order.

In drawing in the two warps for weaving, the pile threads are drawn in on two harnesses at the front, and the ground threads (if the looped formation is to be continuous) on two harnesses at the back as shown at R in Fig. 2 for the 1 ground, 1 pile order in the fabric, and at S for the 2 and 2 order.

When, however, the cloths are made in short lengths with a cross-border at each end, the draft given at T and U are frequently employed. This arrangement enables a weave with a filling float over seven warp threads to be obtained by the alternate lifting of the third and fifth harnesses; the remaining harnesses are left down in forming the float on the face, and lifted in forming the float on the reverse side, as shown respectively at V and W. Specially crammed and colored cross-over effect (headings) can be readily formed in the borders in this manner.

Usually two threads are placed in each split of the reed, and in the 1 ground, 1 pile order, one of each series is placed in the same split as shown above R. In the 2 ground, 2 pile order, however, two ends of the same series are placed together, as shown above S. The two arrangements produce practically identical results, but the 2 and 2 structure has the advantage because by reeding as described, the threads in each split work opposite to each other, and at the same time the pile and ground threads, which, on some picks, work alike, are separated by the wires of the reed, and it is therefore possible to obtain a clean shed.

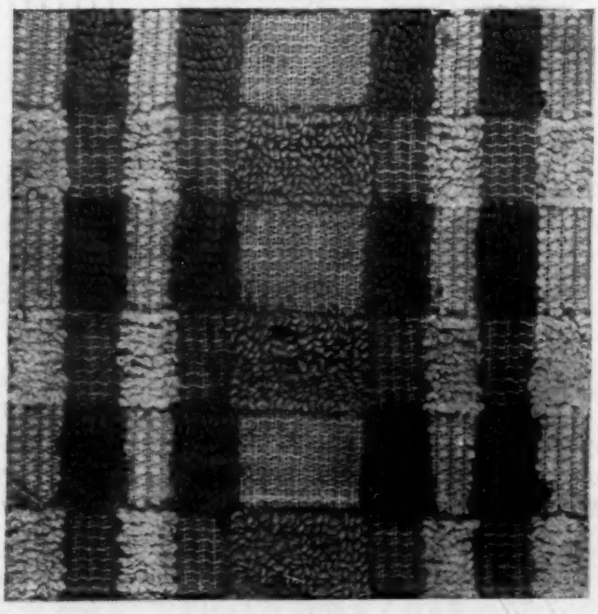


FIG. 5. SAMPLE OF A SINGLE SERIES PILE ORNAMENTATION.

The loom particulars of a very good cotton pile fabric are as follows: Pile warp 2/20s, ground warp, 2/16s, filling 16s; end per inch 50, picks per inch 58. 600 yards of pile warp and 102 yards of ground warp are required for producing 100 yards of cloth. Shrinkage in width will amount to 12 per cent. In cheaper cloths the filling may be 20s and the pick 36 per inch and upwards. The pile warp may be laid one end at a place of 2/20s, and 300 yards and upwards used for 100 yards of cloth. For a soft cloth the pile yarns should be soft spun, and for a crisp handle it should be hard spun.

TERRY MOTIONS.

Different systems have been devised to enable two successive picks of filling to be left back from the edge of the cloth at will. In one method, in which a fast reed is employed, the going part is moved forward for a shorter distance on the two "loose" picks; while in another part reed type, movable front and back rails are provided, which enable the edge of the cloth to be traversed, when required, in advance of the stroke of the reed for the necessary distance. In the system which meets with the greatest favor, however, a loose reed is used which is caused to move backwardly at the bottom, the upper edge of the reed acting as the fulcrum.

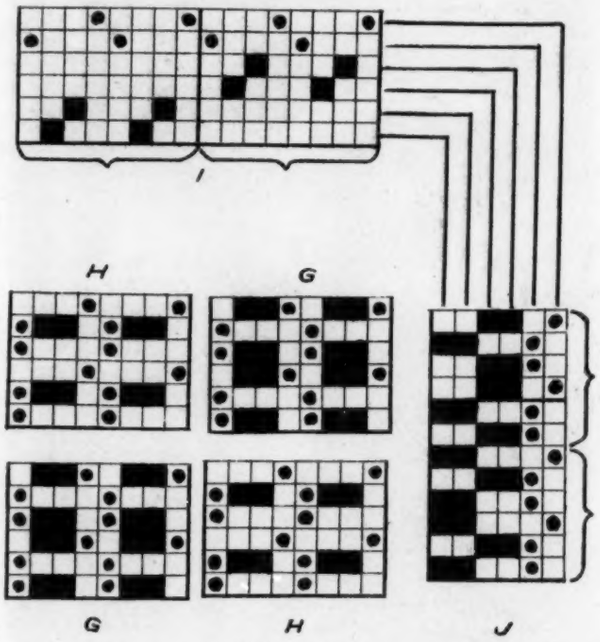


FIG. 6. DESIGN MOTIVE AND DRAFTS FOR SAMPLE FIG. 5.

An end view in partial cross section of this type of terry motion is given in Fig. 3 in which the mechanism is under the control of a dobby or Jacquard. However, in weaving cloths in which the looped formation is continuous, the principle may also be adopted to cam shedding. The parts of the reed motion are indicated in solid lines and the framework of the loom in dotted lines, while a front view of the upper part of the mechanism is shown in Fig. 3-A.

The position of the reed S, during the beating up, is governed by the shedding mechanism through a cord A which is attached to a lever B fulcrumed on A bracket C. If the reed is required to be held firmly, the cord A is not lifted, and then the action of the spring D causes the rear end of the lever B to be raised. The cord E which is connected to this end of the lever B, and which passes around two guard pulleys F, draws upon the rear extremity of a cam G centered at T, and raises the curved portion of the cam to the position shown in solid lines. Then, as the rocker arm U moves forward, an anti-friction bowl H (carried at the end of a lever I which is fulcrumed at V) passes below without touching the cam G, and the lever K, to which the link J is connected, occupies its normal position. The lever K is fixed to the stop-rod L, as are also the lever M (which presses against the edge of the reed) and the duck-bill N. In beating up the filling this duck-bill engages the beater O, and the reed is held firmly in the usual manner.

When the reed is required to fall back for the first two picks, the cord A is raised which lowers the rear end of the lever B. This action releases a sufficient length of the cord E to allow the curved portion of the cam G to fall by its own weight to the position indicated by the dotted and shaded lines. Then, as the rocker arm moves forward,

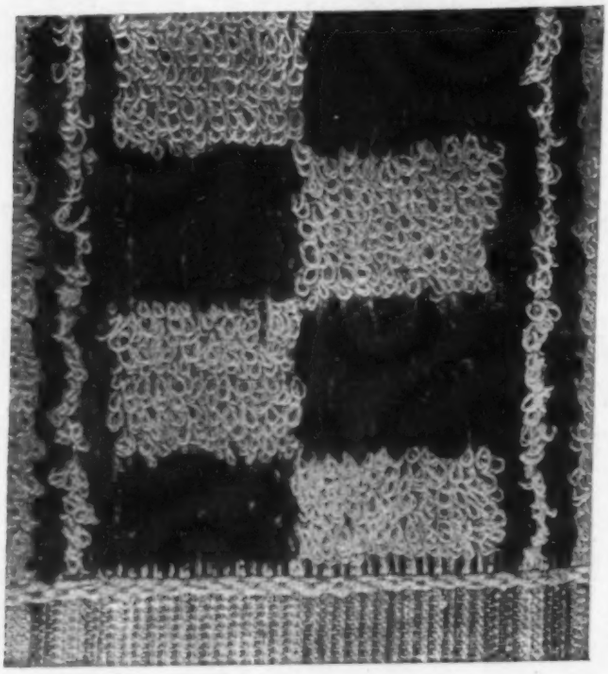


FIG. 7. SAMPLE OF A DOUBLE SERIES PILE ORNAMENTATION.

the bowl H comes in contact with and rises on the face of the cam G. By means of the link J, this upward motion is transmitted to the lever K, which partially rotates the stop-rod L. The forward end of the duck-bill N therefore rises above the beater O, while the upper end of the lever M falls back, with the result that the lower edge of the reed moves backwardly, and the pick of filling is left a short distance from the fell of the cloth.

The extent of the backward movement of the reed may be regulated by moving the ends of the link J nearer to or further from the extremities of the levers I and K. Projections P and Q are used for the purpose of limiting the movement of the cam G. One or more springs R may be inserted in the length of the cord E in order to take up any excess movement of the shedding mechanism.

It is usally convenient to place a large quantity of yarn on the pile warp beam in order to compensate for its rapid delivery. This beam is supported by brackets at a considerable height above the line of the shed. During the production of the terry effect the pile warp is lightly tensioned as shown in Fig. 3, by means of adjustable weight 1, but provision is made for increasing the tension whenever the looped formation is required to be discontinued. Thus, when the cord 2 is raised by the shedding mechanism the other extremity of the simple lever 3, to which the cord 4 is attached, is depressed; therefore the beam-lever 5, to which the other end of the cord 4 is connected, is lowered, and additional weight is put on the pile warp beam. In the case of a towel with a border at each end, the cord 2 is left down while the terry center is being woven, and the action of the spring 6 causes the beam lever 5 to be raised, the additional weight thus being taken off. During the formation of the borders, however, in which the pile warp requires to be practically as heavily tensioned as the ground warp, the cord 2 is raised and the beam-lever 5 lowered all the time to produce the extra tension necessary.

TERRY ORNAMENTATION.

When simple terry weaves are used, such as those given in Fig. 2, the only possible form of ornamentation consists in introducing colored pile threads to form stripes, but if the loops are formed on both sides of the cloth one side may be colored independently of the other. For producing more elaborate ornamentation the pile yarns are caused to form loops first on one side and then on the other side of cloth in the manner represented in Fig. 4. This arrangement may be had either with one or two series of pile threads, producing patterns ranging from simple checks to complex figures.

The principle of ornamentation, in which certain pile threads form loops while others lie straight in the cloth, can not be employed, since all the pile yarn is brought from one warp beam, and it is therefore necessary for all of the threads to form either pile or ground simultaneously. When only one series is used the pattern is due to the pile threads forming loops on the face and back in turn, so that alternate sections of pile and ground are produced on both

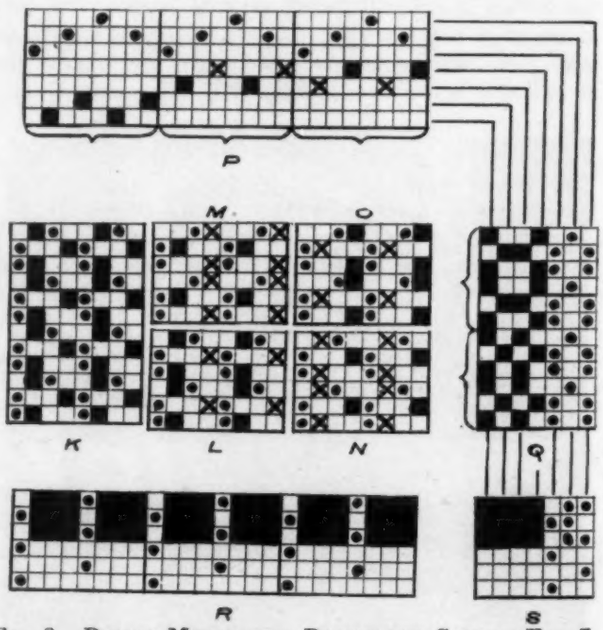


FIG. 8. DESIGN MOTIVE AND DRAFTS FOR SAMPLE FIG. 7.

sides of the cloth. In Fig. 4, diagram A illustrates this method of interlacing, while the weave design which forms the loops on the face is given at B, and on the back at C. In this system of ornamentation colors may be introduced either in the pile or in the foundation threads.

In Fig. 4 diagram D shows how the pile yarns interchange from face to back when two series of threads are employed. In this case both sides of the cloth are covered by the loops, but one series of threads is differently colored from the other series, so that alternate sections in different colors are formed. With the weave E, the loops are formed by the dark threads on the face and by the light threads on the back; and with the weave F they are formed by the light threads on the face, and the dark threads on the back.

With dobby shedding simple reversible designs are ob-

tained usually of a check character, and an example is given in Fig. 5 which shows an effect produced by a single series of pile threads, on the principle illustrated at A in Fig. 4. In this case, however, the threads are arranged in the order of 2 ground, 2 pile. The motive for the design for this sample shown divided into sections is given in Fig. 6. Sections G form pile on the face and ground on the back, and sections H form ground on the face and pile on the back. The drawing-in draft is shown at I and the harness chain draft at J. In producing a given size of check, each section is repeated the required number of times.

Fig. 7 shows a check pattern produced in two colors of pile yarns, on the double series principle illustrated at D in Fig. 4. There is also a continuous stripe effect at each side of the check effect. One series of threads is differently colored from the other series, and in the corresponding design and drafts given in Fig. 8, the black squares represent red pile and the crosses indicate white pile. Section K shows the weave used in producing the continuous stripe, while sections L and O form red loops on the face and white loops on the back, and sections M and N form white loops on the face and red loops on the back. The change of effect between sections L and M, and also between N and O, is due to a change in the weave. In the sections L and N, however, and also in sections M and O, the weave is exactly the same, the change of effect in this case being due to change in the order of coloring. Thus, as indicated by the black square and crosses respectively, the pile yarns, in sections L and M, are arranged 1 red, 1 white, and in N and O, 1 white, 1 red, two white pile thread coming together in the center. The drawing-in draft is shown at P, three harnesses being used for the ground thread. The harness chain is shown at Q.

The lower portion of Fig. 7 shows a cross-border, the bulk of which is formed by continuing the center weave with the terry motion out of action, but there is also a heading produced by floating thick picks over seven threads. The weave design for the thick picks is shown at R, the lifting plan being indicated by S. Three picks float on the face and then three on the back, in order that the border will be reversible similar to the center.

An interesting modification of the latter style of check pattern consists of separating the rectangular spaces from each other by narrow lines of ground, the longitudinal lines being formed by bring about 6 or 8 threads consecutively from the ground warp beam, and the transverse lines are obtained by throwing the terry motion out of action for about 6 picks. This system of forming checks can also be employed when the pile threads are all of one color, and when no interchange is made from one side of the cloth to the other.

The Japanese, who are the principal foreign buyers of Chinese raw cotton, are interested in its betterment. A Japanese firm is experimenting at Nangwang, Province of Kiangsu, with cotton seed obtained from several countries.

Cotton enters into the manufacture of more articles today than any other commodity except steel.

About 20,000,000 yards of cotton duck are made into overcoats with blanket lining, to take the place of heavy wool and fur garments in the American and Canadian northwest.

THE COTTON WASTE INDUSTRY IN ENGLAND.

(*Contributed exclusively to* COTTON.)

BY TEXTOL.

Cotton spinners have always been fully alive to the benefits that arise from economical working and the pecuniary advantages to be derived through a careful distribution or disposal of the waste made in their mills. In the various processes of preparing and spinning cotton there is an unavoidable discharge of fibrous material, along with foreign impurities.

Up to 1850 the quantity of waste in England that could be turned to profitable account was very large, much of it being actually used for fertilizing, but in that year the Garnett machine was invented and manufactured, thus enabling an almost worthless article to be transformed into a valuable raw material. It was considered a substantial

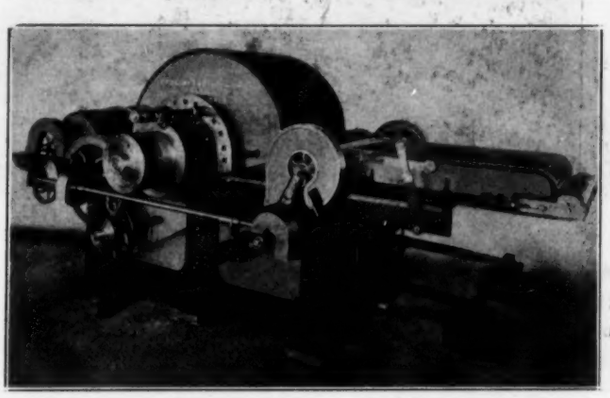


FIG. 1. OPENER FOR ROVING WASTE.

move towards perfection by the cotton experts of that period, but comparatively speaking the possibilities of the machine were very limited. Since that date waste using machinery has been so improved that both output and efficiency are considerably greater than was ever thought possible in those earlier days. Previous to 1850 it was considered an engineering feat to clothe the rollers with 12 or 14 rows to the inch, but in that year a method was invented by J. H. Leather, by means of which it is now possible to clothe a roller with 32 or even more rows to the inch. The value of such an invention was that it is now possible to open up for reworking the finest and hardest threads manufactured in the textile trade. Year by year progress has kept pace with the times until now almost the final word in waste openers, both as regards production and results, may be taken to have been said.

The waste produced at the different stages of cotton manufacture varies in quality, and is usually classified as follows:

Blowing room waste or droppings, which is practically valueless; carded or soft waste, which can be used again with the new cotton, without special treatment; spinning room waste, which, on account of its twisted condition, must be put through special machinery; and roving and clearer waste. The softer waste, such as that from the roving frames, is now re-used in the "mixing" after having been opened on the roving waste opening machine as shown in Fig. 1, without impairing the quality of the staple, the treatment being such as not to damage the fiber.

Other waste, such as cop bottoms is broken up on a

hard-waste breaking machine as shown in Fig. 2, which is made of one, two, three, four, five, six, seven or eight cylinders. Very hard fine waste requires a passage of six to eight cylinders, whereas softer can be broken into fiber by a passage of three, four or five, as the case may be. However, manufacturers can get almost the same effect by passing the material through a single cylinder machine an equivalent number of times, excepting that in the last-named case the economy derived from a larger machine is lost. The economy of a larger machine, that is, one with a number of cylinders, is due to the less handling required, the material once fed into the feeder passing right through the six, seven or eight cylinders and being delivered in a fully-opened condition. This saves time and labor in the relatively increased speeds of the feeding and delivery rollers to each cylinder. The cotton from the first section passes through delivery rollers, with which the feed rollers of the second cylinder run in conjunction, at a slightly higher speed than the feed rollers at the front, and so on right to the end of the machine. The cotton, as it becomes more and more opened, increases in bulk and requires to be taken away more quickly. Then, again makers are enabled to put graduated toothed coverings on machines of a large size to suit the partly opened material, compared with the one kind of covering which has to serve for the several conditions of the material from its first unbroken to its fibrous state in a machine of only one cylinder. Waste thus broken up is utilized for respinning into low counts for the manufacture of sheetings, towels, etc., or for being converted into wadding, or into gun cotton.

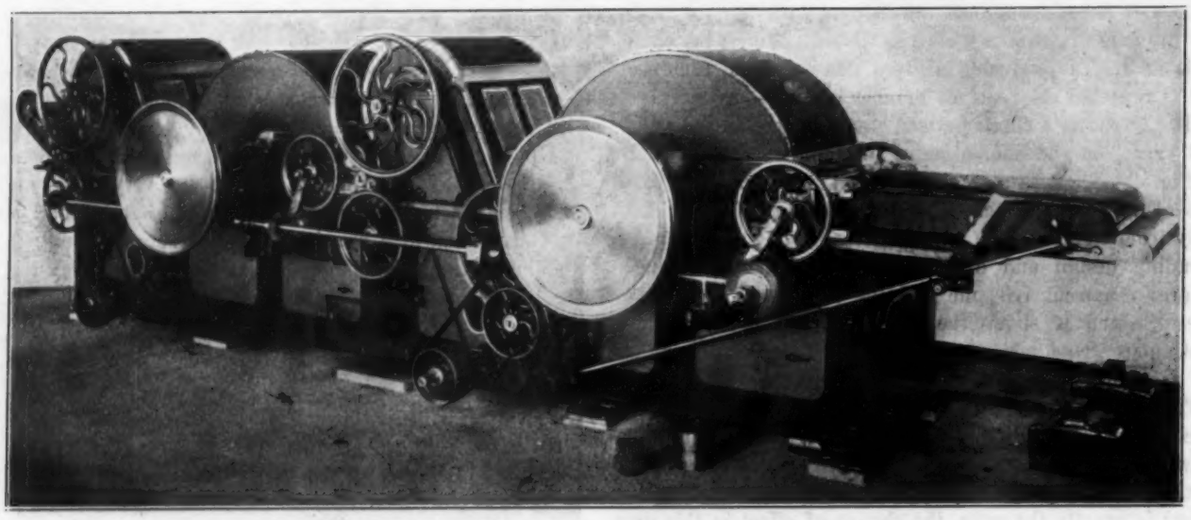


Fig. 2. Two-Cylinder Hard Waste Breaking Machine with Fans.

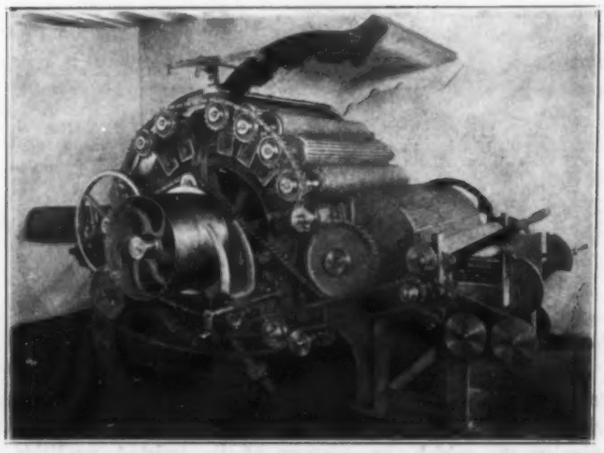


Fig. 3. Machine for Making Engineers' Cleaning Waste.

Fibrous waste which is dirty and oily, is used for making candlewick. This material is first willowed in an Oldham willow, and then passed through a modification of the breaking machine with either one or two cylinders, which machine we term a picker. Occasionally a lap machine is applied to these waste breaking or picker machines to form the fiber into a lap for facilitating handling and better treatment in subsquent machines.

In general, opened roving waste from the waste breaking machine is mixed with the raw cotton at the scutcher. It can be adapted for working in conjunction with any installation of blowing room machinery. Broken-up hard waste which is intended to be re-spun is passed through an ordinary cotton scutcher and then to the waste carding engines. These are generally in sets, comprising a "breaker" for feeding by hand or with laps from the scutcher, with an intermediate "Scotch" feed delivering to a "finisher" carding engine which has a condenser attached for bringing off about 30 ends. This also applies in the case of waste from the picker, and the subsequent treatment follows the usual process applied to coarse counts.

It is however impossible to utilize all waste for respinning, and certain of this, such as damaged warp ends, twisted threads, and material of a like hard nature, is made into cleaning waste on a machine as shown in Fig. 3. In the manufacture of this latter material, old cotton ropes are also used being cut into short lengths, untwisted, and fed with the above, and thread waste extracted from loom sweepings. A machine for extracting thread waste is shown in Fig. 4. Waste of a low count, that is, waste of a short staple, is often made into tailors' wadding. Some of this is bleached and some also is made antiseptic for surgical purposes, although the last-mentioned kind of wadding is largely manufactured from the lowest class of raw cotton. In making tailors' wadding the material is opened on the breaking-up machine, and occasionally cotton rags are utilized with waste for this

purpose, the rags having first been broken up on a rag tearing machine as shown in Fig. 5, in which case it is usual to adopt a breaker of two cylinders.

The carding engines for making the wadding are worked under two different systems. As wadding consists of films of cotton laid one on top of another, to get such an effect it is necessary to either have a series of carding engines, each delivering a film on to a traveling lattice, and being made into a lap at the end, or some other arrangement that will give the same result. This latter consists in an improved cross folder, by means of which wadding can be made on a single card by intermittent motion of the bottom lattice of the folder as it is filled to the right thickness from the upper creeper delivery. On this apparatus any width of lap down to 18 inches can be made and of a variable thickness. The advantage of this "short" system is that different classes of wadding can be going through the mill on different cards at the same time, and a start can be made with one or two machines. On the other hand the "long system" offers an advantage where it is desired that the outer surfaces shall be of a better character than the intermediate layers, as different classes of material can be fed to the various machines for the one product. Tailors' waddings are in general required with a hard surface. This is obtained by passing the wadding over a gumming roller, and drying the wadding, which gives it a kind of skin. The machine used is shown in Fig. 6.

Talking with leading makers of waste-using machinery, various interesting statements were obtained and it may not be out of place to give two of these statements verbatim, one by Platt Brothers & Co., Ltd., of Oldham,

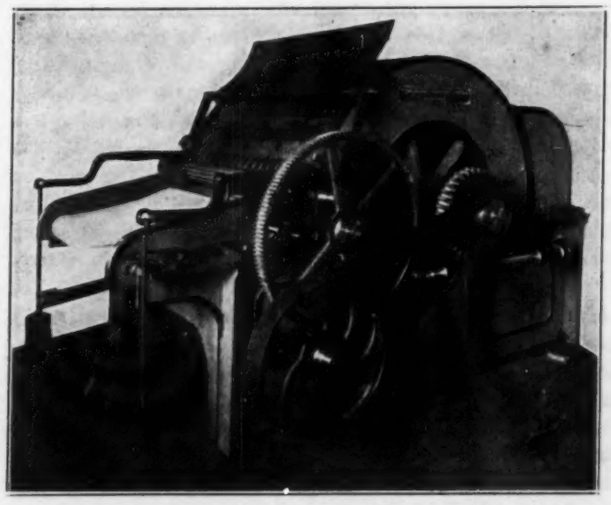


FIG. 4. IMPROVED MACHINE FOR EXTRACTING THREAD WASTE.

and the other by P. &. C. Garnett, Ltd., of Cleckheaton, Yorkshire, which rather summarize the use of the cotton waste. The former concern said:

"From card droppings, strippings, etc., sponge cloth or engineers' cleaning cloth is made. Cotton blankets are made from card strippings, broken up cop-bottoms, etc. From the best qualities of waste and broken up cop-bottoms, sheetings of a great many qualities are made, as well as tapestry cloths and trouserings of all colors, shades, and styles. All kinds of imitation woolen cloths are made from the various classes of cotton waste.

"The processes required up to and including the spinning are, self-acting willow to loosen the material and shake out the dust; cop-bottom breaking-up machine to break up cop-bottoms and hard waste; single Crighton opener to open and clean dirty material; improved single scrutcher and lap machine to further clean and form the waste into laps ready for the breaker carding engine; breaker and finisher carding engines, the latter being fitted

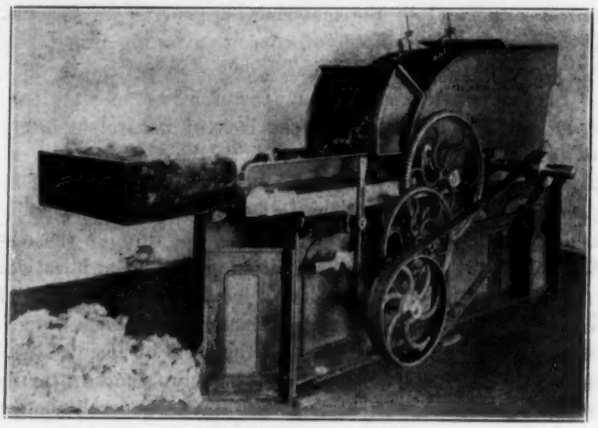


FIG. 5. TEARING MACHINE FOR RAGS.

with a condenser to prepare the carded waste into thin threads or roving ready for spinning into the counts of yarn required for any special purpose and in accordance with the class of material used. The spinning may be done on the self-acting mule, ring spinning frame, chapon cup spinning frame, or roving frame for coarse carpet yarns with two or three threads from the condenser drawn or twisted into one thread. From the spinning machine the yarn is taken to the loom to be woven into the particular fabric required, the kind of loom depending of course upon the class of cloth to be made."

Messrs. Garnett said: "In a general way, cotton wastes may be classified under three headings:

"(1) Linters, which are the short cotton fibers which remain on the cotton seed after ginning, and are subsequently removed. A quantity of these linters are used for medical wadding and the lower qualities for cheap waddings.

"(2) Hard wastes are composed of cop-bottoms, and ring frame wastes. Some of these are opened out on a machine and used for high class cleaning waste for engines, locomotives, motor cars, etc. Other hard wastes are broken up on large waste openers into fiber again, and sometimes the opened material is used for wadding. It is also re-spun into coarse yarns for cheaper cotton hosiery yarns, also for cotton blankets, and rugs for Eastern countries, also for candle wicks, and cleaning cloths.

"(3) Soft wastes comprise roving waste, card engine cylinder and flat strips roller lapping, scrutcher droppings and card waste generally. Most of these require cleaning on a good willow, and opening on a small sized opening machine. The cleaner and better class of these wastes can be used for re-spinning for medium and coarse yarns. Others can be employed for very cheap yarns for cleaning cloths and candle wicks, etc. Some of these soft cotton wastes are also for mixing in small quantities with

shoddy for the cheaper classes of woolen cloths. The above are a few uses to which cotton wastes are put."

PHYSICAL AND MECHANICAL IMPROVEMENTS IN SIZING METHODS.*

BY LEONARD W. CRONKHITE.

All cotton manufacturers use sizing materials intended to make a cotton warp meet the physical requirements put upon it by the loom, and the cloth effect desired. In view of recent experiments general improvements in the machinery and to an extent in the materials, appear to be feasible. These advances are matter of concern to sizing practice in every country.

In America the cotton manufacturer has an additional sizing problem of his own. The lack of natural humidity in this country operates against both the weaving rate of any cloth and the very character itself of finer cloths. The question as to how this climatic disadvantage can be remedied not only by humidifying systems, but through the medium of sizing as well, needs solution and wider application.

What physical demands does a loom make on the warp? The intensity of any one of the demands depends on a number of factors in connection with the style of loom as well as the style of cloth. In view of the many factors in textile work, any answer must be flexible. But in general, contact of the warp with the tension rods, with the drop wires of automatic looms, with the harness, with the shuttle, with the reed, and with other threads, are all factors which primarily demand in the sized warp ability to resist chafing. In nine cases out of ten the surface resistance of the warp is the important problem to solve for the purposes of production.

It is true that the opening of the shed and the general tension in the loom require pulling strength and "elasticity" in the warp. It has accordingly been asserted that, above all other kinds of mixtures, penetrative sizing mixtures are useful, primarily because by internally binding the fibers together, they strengthen the yarn. Holding this view, the writer took issue with a mill agent who believed that all the tensile strength in a yarn that can be of any use lies in the quality of cotton and the manner of its spinning, and that, in nearly every case, weaving even of poor yarn depends more on sizing with other purposes in view than with the purpose of increasing tensile power.

Contrary to frequent assertion, tensile strength is scarcely increased by sizing in the majority of cases to any really relevant extent, and also "stretch" or "elasticity," is only remotely increased by sizing. The elements that do contribute to it lie in the length of the staple, the twists per inch, and the moisture both in the sized yarn itself and in the yarn as it weaves in the shed. Ordinary methods of sizing are quite as likely to ruin the elasticity of a yarn as to help it, and the impregnation of a yarn with a hardening mixture, such as many starch mixtures are, is likely considerably to decrease elasticity.

All this is not to say that penetrative mixtures do not perform a useful service; thinner mixtures undoubtedly aid in holding the starch to the yarn during weaving and add a fulness of "feel," partly by filling the yarn, and partly because thinner mixtures leave the fibers more as a nap on the warp, and in colored goods least obscure the colors. Contrary to the opinion of some, however, thinner mixtures perform even the service of filling the cloth only when they are thinner, due to the essential viscosity of the starch itself which enables a comparatively large quantity of starch to be carried in a very fluid form. It is to be remembered that neither the breaking strength of a sized yarn, nor its elasticity is by any means the essential criterion of its weaving powers for a given style of goods, and all the advantage may be lost in inability to resist chafe. While impregnation of the yarn may in some small degree increase its tensile strength and may in the case of certain mixings even slightly add to the degree of elasticity, the primary demand of a sized warp is that it possess surface resistance to chafe.

Surface resistance implies two things, namely, laying

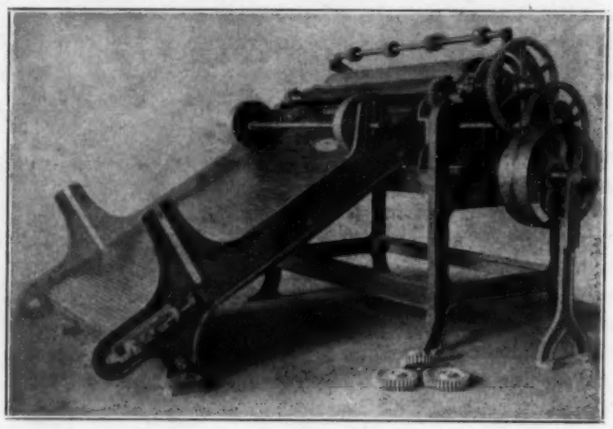


FIG. 6. GUMMING, DRYING AND LAPPING MACHINES FOR COTTON WADDING.

the fiber, and making the coating on the warp as frictionless as possible. The fiber needs to be laid to stay down through the weaving process, and whatever lays it down needs to be as free as possible from any characteristic or acquired harshness, a virtue which, of course, is generally appreciated in the smooth feel of the cloth. A sizing mixture therefore needs, according to the demands of a given weave, (1) to have a heavy enough "body," in the essential viscous nature of the starch, to coat the yarn on the outside, (2) adhesiveness sufficient to hold the fiber and to cling to the yarn, and (3) a softness or lubricating property, such as is greater in potato than in corn starch.

What, however, does the present machinery do? The slashing machine dips the yarn in size and dries it, as is obviously necessary. By a system of lease rods, the slashing machine pulls apart the dried sheet of yarn; that is where the weakness of the slashing machine lies. One has only to feel how sized yarns, especially coarser yarns sized with the harsher starches like corn starch, "open" at the rods, to suspect that this opening a sheet of yarn tends to undo half the work of sizing. In most cases it pulls up the fiber which at best is only imperfectly laid at the squeeze roll. What appears to be a perfectly sized yarn, is obtained by running a thread through the fingers wet with size; every fiber of the thread is well laid. Attempts have been made to bring the work of the slashing machine more to this kind of result, by the use of revolving brushes to lay the fiber better in applying the size, and by using small intermediate lease rods to separate the strands during the drying process. It is obvious, of course, that the achievement of slashing a warp thus perfectly would bring up the question of "cover" on the cloth, since the fibers would be too well laid for many cloth effects.

*Paper delivered before National Association of Cotton Manufacturers.

Improvements in the physical nature of sizing materials relate particularly to the question of pliability, which, after surface resistance, is the other prime virtue demanded of a sized cotton warp in the weave shed. This other weaving requirement, liability, affects not only loom production, but also the possibility of getting certain cloth effects. This is a question which the nature of the climate makes of the greatest importance in the United States, especially in sheds of the "saw-tooth" type, where getting sufficient moisture in the yarn is a special problem. We can lay the fiber to an extent by employing the more adhesive starches and "sizes" cooked in the most approved method, and can get lubrication and a certain amount of pliability by employing the proper softeners and the less harsh starches like potato starch; but in fine goods and with the best humidifying system obtainable, there remains a degree of pliability in yarns that the American factory has no damp climate to produce for it. The road to the desired result lies by the way of starches, softeners and deliquescents, each chosen according as it least hinders the physical effect of moisture in the yarn.

That starch, according to its characteristic, should have a vital bearing on the question of maximum pliability in dry sheds, does not everywhere seem fully known. As between the two starches, corn and potato, the judgment of the investigator is frequently one of commercial bias needed in the exploitation of one firm's products. Potato starch avers that corn starch can not be used in any form on anything but the coarsest work. The fact is that corn starch has been used with some success on medium goods, generally requiring less starch. Corn starch advocates state that "potato starch makes a size which is stiff and harsh." This statement is made in the face of the fact that in the experience of most mills, no starch has more of that characteristic softness than potato starch, and that in England where such matters are put to extreme tests, very few mills elect to size with corn starch. Potato starch has a constitutional weakness under long boiling or when left standing after boiling, and has a high cost and lack of uniformity, while corn starch has its characteristic harshness and lack of very great adhesive powers. For purposes of pliability potato starch has far less tendency to be harsh and brittle in the absence of maximum moisture. Potato and corn starch do not represent the latest step in starch science.

At best, however, no starch alone can wholly solve the question of pliability under all conditions without the addition of softeners and "sizes." Softeners can greatly help matters so far as moisture in the weaving shed is concerned. The usual softener, tallow, mixes with the starch in what may be called a purely "mechanical" way, melting under the influence of the boiling heat and cooling as a clot on the yarn. Such softeners are not soluble or very diffusive in water, and on the yarn tend to repel moisture. For this reason the ideal softener is one that to an extent is soluble in water. Care needs to be taken with regard to the chemical character of ingredients mixed with such softening materials, since some of the cheaper substances likely to be used as "sizes" and as "deliquescents" do not always take kindly to soluble products for softening purposes.

It is obvious that with starches of different characteristics, with softeners of all kinds from tallow, and its many substitutes to soluble softeners and the inevitable imitations, with "sizes" made from gums, dextrines, malts, diatase, caustics of various chemical reactions, and with such deliquescents as the chloride of magnesium and calcium, the manufacturer needs the aid of expert opinion that can advise impartially.

SHUTTLE BOXES.

The back box plates are set at exact right angles with the lay ends by filing the ribs or fitting strips at the back of the plates. The back box plates must be set in line with each other, the reed being preferably set slightly back of this line, as it will not do to run any chances of having the reed in front of this line. A long steel straight edge is necessary in order to try the plates and see that they are in proper position.

The front box plates should be set so that the top will lean slightly toward the back box plates, thereby reducing the liability of the shuttle rising in the box. If set at a right angle it will probably work all right, but it must not lean from the back box plate. At the same time it must not lean much toward the back box plate or it will wear the top of the shuttle. With back binder looms, the front plates are adjustable and should be set so as to line the point of the shuttle in the center of the picker stick slot. With the front box plate in position, adjust the binder properly by loosening the nut on the end of the screw which passes through the binder bushing, turning the bushing which is eccentric, until the binder is adjusted to the proper position.

A binder may be of wood, wood with leather face, wood with steel face, wrought iron, cast iron, or iron with leather attached. A wooden binder faced with leather, gives good services, as the leather does not wear the shuttle so badly as either wood or iron. Iron binders bring a hard pressure on the shuttle when the loom bangs-off with the shuttle part way in the box, the whole force of the momentum of the lay being transferred through the protector rod, binder fingers, and binder to the shuttle, often breaking its sides, as it is pinched in its weakest part. The wooden binder will bend sufficiently to relieve the shuttle. The shuttle boxing is better also, as there is more spring to the wood and less weight to be moved.

The shuttle and leather facing on the right-hand, front box-plate of Northrop looms are provided with grooves which come opposite the hole in the side of the shuttle, from which the filling is delivered as it weaves off. These grooves prevent the filling from being pinched between the shuttle and the box-plate when the shuttle-eye is at the outer end of the box, as is the case on the right-hand side of the loom. As the shuttle wears, the groove in it will gradually become shallower and in time may entirely disappear if not attended to. At the same time, the presence of the shuttle against the leather facing on the right-hand box-plate will cause the groove in the leather to fill up, so that sometimes there is no passageway whatever for the thread. The thread will then be pinched and flattened out each time the shuttle enters this box, and it will frequently be so weakened that on the succeeding pick it will pull apart. This is very apt to cause mispicks as the thread remains in the shuttle-eye and extends in front of the filling-fork, so that the loom is not stopped as it should be. Sometimes the thread will not break but will stick to the leather and make a fringe on the selvage. These troubles are easily prevented by using a round file to deepen the grooves in the shuttle and leather facing.

WOOL MANUFACTURING.

DESIGNING BEDFORD CORDS.

ALL COTTON BEDFORD CORDS.—MIXED BEDFORD CORDS.—ALL WORSTED BEDFORD CORDS.—TWILL FACE BEDFORD CORDS.

(Contributed exclusively to COTTON.)

BY EMIL KAHN.

(Continued from September.)

In this grade of fabrics the most effective patterns are obtained, due to the nature of the yarn. Its loftiness and fulling properties are material factors in the production of handsome fabrics. The perfection of the fabric, however, is brought about in the finishing process after the fabric is woven.

Various counts of worsted warp and filling are used, but the best effects are obtained with the finer counts of yarn such as 2/60s, 2/70s, and 2/80s worsted warp and 1/40s and 1/50s filling. These qualities are woven on broad looms, the finished width ranging from 44 to 54 inches. The type of weave used is the one shown in Fig. 2 (Setember issue).

A very novel effect, made with fine counts of yarn, is shown in Fig. 8.

It will be noticed from the sample that the cords are more or less broken up, thus producing a kind of crepe effect. This effect is produced by having the filling threads float under two adjoining cords and thus bring them together. After the required number of picks have been put in the cloth, the filling is stitched in between the cords with two ends of the plain weave, as shown in Fig. 9 which gives

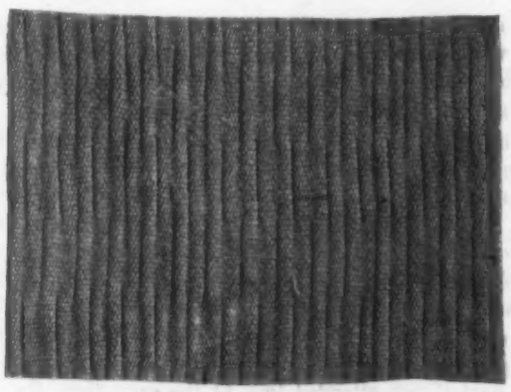


FIG. 8. SAMPLE OF ALL WORSTED BEDFORD CORD.

a complete repeat of the weave, with the corresponding drawing in draft, and harness chain draft. The design can be woven on 12 harness and repeats on 64 picks.

The construction is as follows:

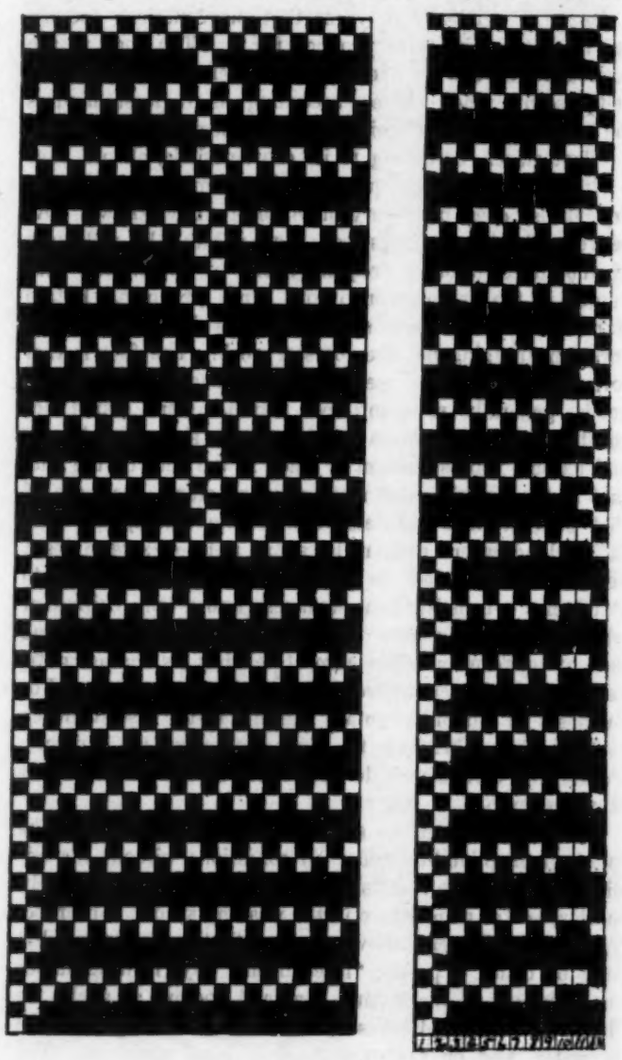
Reed 28x4.
Width in reed 54½ inches.
Warp, 2/80s worsted.
Filling, 76 picks per inch, 1/40s worsted.

22 ends in a repeat of the weave.

Total ends in warp 6104, including 60 ends for selvage.

These goods are piece dyed and are finished 50 inches wide.

The Bedford cord weave is often used in combination with some other weave in the same fabric, usually in the form of a series of stripes as an ornamental feature of the fabric, and when so used, the cords are made to stand out as prominently as possible. In order to acquire this prominence of the cords, wadding threads are inserted behind the cords, which also tends to give the cord a much more rounded appearance. Fig. 10 shows a sample of fabric with cords used in combination with a broken twill weave. Wadding threads are used in the cords. Fig. 12 shows how



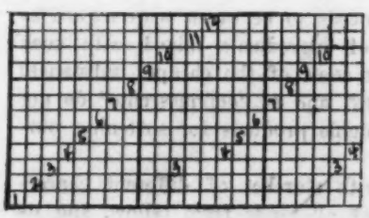


FIG. 9. WORKING DESIGN FOR THE PATTERN.

these wadding cords are inserted. This design represents only one cord, from which the whole design for the fabric may be obtained by following the plan shown in Fig. 2. The twill ground between the series of ends is a 2-2 four harness broken twill weave.

The ends in the Fig. 11 marked 6 and 7 are wadding ends. These are always raised during weaving, when the

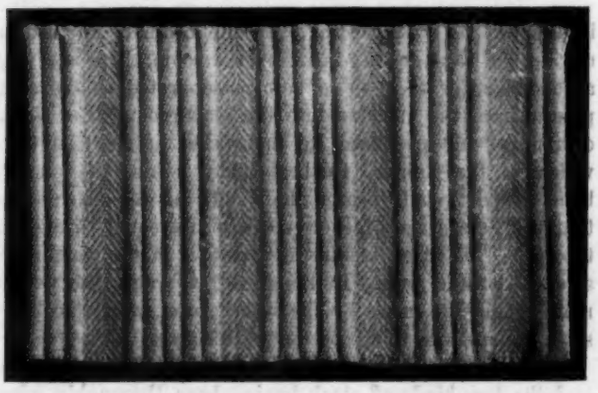


FIG. 10. SAMPLE OF BEDFORD CORD STRIPE EFFECT.

filling is floating on the back of the cord, and depressed when the filling is interlacing with the cord. The wadding ends should always be of a much coarser count than the body of the warp. In Fig. 11 only two wadding ends are used. The face warp is composed of 2/60s yarn; and two ends of 2/30s yarn for wadding ends will give better results than by using four ends of the same count as face warp.

The best reeding plan for this cord would be to reed ends 1 to 6 inclusive in one dent; ends 7 to 12 inclusive in next dent.

The wadding ends are generally figured as extra yarn. For example, if the pattern was composed of a series of Bedford cord stripes and some other weave, such as a twill or satin, the latter weave would be reeded four ends in one dent, whereas the cord would be reeded six ends in one dent.

TWILL FACE BEDFORD CORDS.

Bedford cords are occasionally made with a twill weave face effect, principally in men's wear fabrics, primarily be-

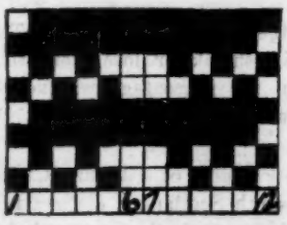


FIG. 11. DESIGN OF CORD WITH WADDING THREADS.

cause twill weaves are more desirable in this grade of fabrics.

Fig. 12 is a design for a twill weave face effect Bedford cord, with drawing in draft and harness chain draft. The twill is shown in the form of a herringbone effect, 16 ends forming a right hand twill and 16 ends forming a left hand. The floating and interlacing of filling is exactly on the same principle as shown in Fig. 2.

FINISHING BEDFORD CORDS.

Piece dyed fabrics are scoured, then dyed, after which they are brushed, sheared, pressed, and made into rolls of about 50 yards in length.

Yarn dyed fabrics are slightly scoured, brushed, sheared, pressed and made up into rolls in the same manner as the piece dyed goods.

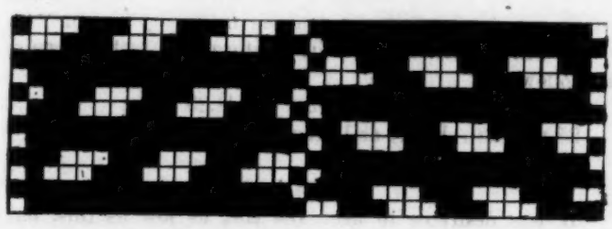
THE SELECTION AND USE OF SHODDY.

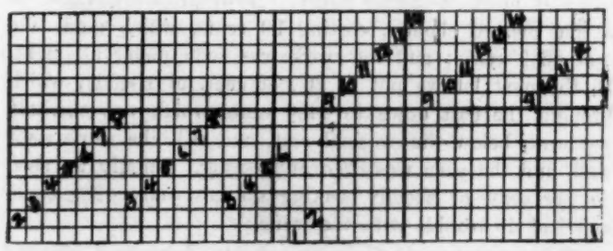
(*Contributed exclusively to* COTTON.)

BY O. F. IRELAND.

The occasional cry against the use of shoddy, and the attempt to restrict or regulate its use by legislation has usually been short lived, but is likely to be repeated from time to time, until the fallacy of such attacks is made manifest. There was a time when the adulteration of the stock in woolen goods could be reasonably looked upon with more or less suspicion, but the great demand for medium and low-priced goods, together with the improved facilities for producing shoddies, have entirely changed the aspect of the question.

The day has long since passed when shoddy is composed of "ground up" materials of doubtful quality. The machinery and methods employed for producing it have greatly changed, and it is a great mistake to suppose that a cloth is worthless, or that it is gotten up to deceive and cheat the trade, because it contains a percentage of shoddy. In fact, the manufacture of wool substitutes has been brought to that point of excellence where the better grades of this stock are superior to some of the lower grades of wool.





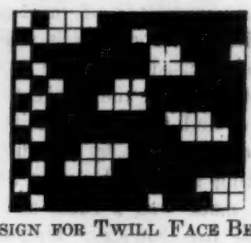


FIG. 12. DESIGN FOR TWILL FACE BEDFORD CORD.

The great demand for medium and low-priced goods, to meet the needs of the masses, has made adulteration necessary, but the keen competition to excel has tended to force the manufacturers to produce the best possible fabric from its use. The margin of profit is doubtless greater on the high than on the low-grade cloth, and the

manufacturer would prefer to make the former if he were sure of a market for it.

In the use of shoddy, wisdom in selection and skill in manipulation are the keynotes to success. There are different kinds of shoddies, and he who can make his selections wisely and manipulate intelligently has more than half the battle won. Although the object in using shoddy is to cheapen the cloth, the cheapest shoddy is not always the best, and care should be taken not to defeat the object in view. The character of the cloth, as well as the stock with which it is to be combined, should be considered. The wool and shoddy should be selected with special reference to the mixture desired in order to get a uniform blend and perfect yarn.

The writer recalls an instance in his own experience that illustrates the advantage of having the right selection of stock. He was called to a mill where they were having trouble on account of uneven and tender yarn; the work was going very badly in the spinning and weaving rooms. The wood used was a fine Territory, costing at that time 55 cents per pound, and the shoddy costing 15 cents per pound. The mixture was 75 per cent. of wool and 25 per cent. of shoddy. Upon a careful examination of the shoddy we found it to be of a fairly good staple, but coarse and wiry; not at all adapted to the stock combined with it. There was such a difference between the two that there was a constant tendency for the shoddy to "lag behind" so to speak; and in the spinning the coarse fibers of the shoddy caused a slipping apart of the fibers of the two kinds of stock, resulting in "twitty" yarn.

It will be noticed that the mixture cost just 45 cents, as follows:

75 per cent. wool at 55 cents = 41.25 cents.
25 per cent. shoddy at 15 cents = 3.75 cents.

Total = 45.00 cents.

It was desirable to keep the cost as low as this, but to use the same proportions with a better shoddy would bring it up to a higher figure. However, we changed to a fine merino shoddy, costing 20 cents, which made the cost 46¼ cents; and the work was soon going all right. In the next lot we put in 30 per cent. of shoddy, which brought the cost down to 44½ cents which was one-half per cent, below the original cost, and still the work went well, and the yarn was even and strong. Finally we used 35 per cent. of shoddy making the cost only 42¾ cents and had no trouble with the work.

This experiment demonstrated two important things: First, the necessity of having two kinds of stock as nearly as possible of the same grade of fineness; and secondly, that the higher priced shoddy stock is not always the most expensive if properly used. A little later on two other facts were brought to light; the production was improved by the better yarn, and the finer quality of stock added to the excellence of the cloth by making a better felting mixture and resulting in a much softer and better finished fabric. The yarn made was 4 runs, and the shoddy first used was too coarse for that size. Had it been from 1 to 2 runs it would have made better work. The fact is that a finer stock means a greater multiplicity of fibers, and hence better yarn, especially in fine numbers.

If the fabric is to be well felted, the fulling quality of the shoddy is of equal importance with that of the wool; and if the cloth is to be a cheviot, the shoddy as well as the wool should be suited to the desired end.

Some manufacturers look with suspicion upon what is termed "fleeced stock," which is a shoddy having a percentage of good wool or long stock combined with it. They look upon it as an effort to disguise the shorter stock, and so defraud the buyer. When the fleecing is properly done it possesses a real advantage that is worth considering. The addition of the long stock puts it into a condition that insures a more even and satisfactory mixture in the picking and carding. In the ordinary method of mixing wool and shoddy in the picker room, there is always a tendency for the two to become separated as the stock passes from the machine into the blow-room. The strong current of air produced by the picker carries the wool, which is the lighter, farthest away, while the shoddy, being heavier, falls nearer the mouth of the machine, so that the percentage of short stock is not equal throughout the lot. This often results in variation in the weight and strength of the yarn. In the card feeds also, the wool is more readily taken up by the spike apron, while the heavy stock often drops to the bottom of the feed.

Now the wool in the fleeced stock serves as a carrier, and the two kinds of stock having been thoroughly mixed in a previous carding, can not become separated, and the mixture is more uniform in consequence. Whether or not the shoddy is fleeced, too much care can not be taken in mixing in the picker room. In putting down the layers of the different kinds of stock, they should be made thin and even. When the stock is carried back for a second or third picking, care should be observed to thoroughly mix that which has been separated, as above described. To get the best results the two kinds—the light and heavy—may be put down in layers, the same as in laying down for the first picking.

As a precaution against the separation of the stock, it is well to have the blow-room as small as possible. By this means the wool can not get far away from the shoddy. The writer once changed a blow-room from 15 feet square to 9 feet square, and found it a great advantage, as all the stock had to keep within a small compass, the lighter stock coming down where the heavy had already lodged.

In mixtures of two or more colors it is best not to change the percentage of shoddy, if it can be avoided, after samples have been made, for it will certainly result in a change in the shade of the goods. The shoddy being very greasy, will shrink or lose more than the wool in finishing, so that the percentage will not be the same as when weighed out for the lots.

Consul Rufus Fleming, of Edinburgh, reports that in the tweed trade of south Scotland a distinct rebound from the depression which overtook the woolen industry about two years ago is now observed. The consul's particulars follow:

Inasmuch as this recovery seems to be more pronounced than the upward movement in Yorkshire, the Scotch manufacturers attribute it largely to a revived public preference for rough woolens; in other words, rough goods are having their turn in the popular fancy. Whether or not this explanation is the true one, there can be no doubt that the mills are busy. Certain manufacturers have been obliged to start auxiliary work in mills hitherto standing idle. No fewer than four or five derelict woolen mills in Galashiels have been reopened. Both the spinning and the weaving departments are well employed in Galashiels and Hawick, and there are indications that this prosperous condition will continue into the new year.

KNITTING

THE UNDERWEAR KNITTING MILL.

SPRING NEEDLE AND LATCH NEEDLE RIB MACHINES. FINISHING UNDERWEAR; DESCRIPTIONS OF PROCESSES AND MACHINES USED.

(*Contributed exclusively to* COTTON.)

BY C. O. TERWILLIGER.

RIB KNITTING MACHINES

This class of machinery may be divided into two classes, namely; those using latch needles and those having spring needles. The latter class is of comparatively recent origin, the particular claim being made that a smoother and evener fabric with more elasticity can be produced. Until the advent of the spring needle rib machine, little improvement of the latch needle machine was made, but during the last few years the latch needle machine manufacturers have made wonderful progress in perfecting, or rather refining their product, until to-day it is a difficult matter to determine which of the two styles produces the better fabric.

Although opinions may differ, we think the latch needle machine is better adapted to produce the heavier fabrics, both in point of cost of production and the ability to handle a cheaper grade of yarn. Any one who is contemplating the installation of a rib knitting plant will do well to investigate very thoroughly both types of machines. The Crane Mfg. Co., Lakeport, N. H. and Chas. Cooper, Bennington, Vt., make the spring needle rib machines, and the following concerns build the latch needle machines: General Machine Works, York, Pa., Nye & Tredick Co., Philadelphia, Pa., Scott & Williams, Philadelphia, Pa., Stafford & Holt, Little Falls, N. Y., Wildman Mfg. Co., Norristown, Pa., H. Brinton & Co., Philadelphia, Pa., H. P. Snyder Mfg. Co., Little Falls, N. Y., and Leighton Machine Co., Manchester, N. H.

Any of the above concerns will submit machines for trial, and suggest just the right gauge to use to produce the proper weight of garment. Practically every style of undergarment is made in the rib fabric, from an infant's band to a heavy 24 pounds to a dozen men's union suit. We advise having the rib machines equipped with stop motions. This device stops the machine before any imperfect yarn gets into the needles, or when the yarn breaks. It also prevents a wholesale breakage of needles which would mean not only the loss of the needles, but also jamming the walls of the cylinder and dial. A stop motion wisely adjusted and kept in condition will save the mill much imperfect work.

We have now reached the finishing department, and must select suitable sewing machines for the several finishing operations. The selection depends upon the class of goods to be made. We will divide the different styles into five classes, namely, light weight and heavy weight flat goods, light weight and heavy weight rib goods, and wool goods. In selecting the machines for each of these styles, we shall only consider the staples, but shall be glad to answer through our column any questions on special equipment. The light weight flat goods of the balbriggan type will require cuffs and anklets. The machines necessary to provide these are made by all of the latch and spring needle rib machine manufacturers.

SEWING MACHINES FOR LIGHT WEIGHT FLAT GOODS.

The first operation consists in attaching the cuffs and anklets to the sleeves and drawers. In cheap goods this is done by sewing them in, using a machine for the purpose made by any of the following concerns: Merrow Machine Co., Hartford, Conn., style 60K; Union Special Machine Co.; Wilcox & Gibbs Sewing Machine Co.; Chas. H. Bridoux, and Metropolitan Sewing Machine Co. Machines of this type make a seam which is trimmed and covered all in one operation; it is also very strong and elastic. Of late years some manufacturers of the better classes of underwear are adopting this seam. A second method is possible by using the Dewees trimmer, and the covering machine made by the Union Special Machine Co. While the seam made is very flat it requires two operations.

THE LOOPER.

In the better classes of goods the rib portions are attached to the knitted garments or hose by a looper. This operation calls for skilled labor, as each stitch of the cloth and rib is put on a point of the looper corresponding to needles in the knitting machine. The result is a very small seam, so small in fact that the rib seems a part of the knitting of the garment proper. Loopers are built by Campbell & Clute Machine Co., Cohoes, N. Y., Wm. Beattie & Co., Cohoes, N. Y., William Hepworth, Philadelphia, Pa., and the Grosser Knitting Machine Co., New York city. The machines made by the above concerns produce a seam having much elasticity, and are also capable of operating at very high speed.

SEAMING AND STITCHING.

The next operation is that of seaming. The machines for this purpose are made by the same concerns who make the rib sewing machine. For many years the Dewees trimmer and covering machines were used exclusively for this work, but the elasticity and saving in labor obtained by the so-called "Interlock" machines (sewing, trimming, and covering in one operation) have made this class very popular.

The next operations are stitching and trimming the neck of the shirt. The Union Special Machine Co. makes a machine which does this in one operation, effecting a large saving in labor over the old process of stitching down the neck and then trimming it with a pair of shears. If the drawer has to be taped or reinforced, tape sewing machines will be needed. Such a machine has two needles, and stitches both sides of the tape to the drawer. The Singer Sewing Machine Co. builds a lock stitch machine for this work, and the Union Special Machine Co. a chain stitch machine.

In light weight garments the seat of the drawer must be reinforced with an extra piece. Perhaps no part of the finishing operation requires so much care in the selection of the proper machine for this work. There is much strain on this part, so that it is necessary to have a strong seam, and at the same time not bulky or hard. Many methods of stitching in the seat have been tried but none have proved so efficient as the Singer "zig zag"

(Wheeler & Wilson make). The "zig zag" stitch is very elastic, and covers the edges of the seat nicely, making a flat seam. The latest type of machine can be operated about as fast as the ordinary lock stitch machine.

The next process is stitching the bands to the drawer, and for this purpose the lock stitch or chain stitch type of machine must be used. The double thread stitch as made by the Union Special Sewing Machine Co., produces a very satisfactory finish. Some mills use the single thread stitch made by the Singer Sewing Machine Co., and the Wilcox & Gibbs Sewing Machine Co. The only objection to this stitch is the liability to ravel. The lock stitch machine made by the Wilcox & Gibbs Co., gives very satisfactory results. The lock stitch is by far the neater, and where elasticity is a negligible factor, we strongly advise its use, especially on the better classes of goods. Another feature of the stitch is the impossibility of raveling it. This is very important in stitching on the band and trimmings.

The next operation is trimming the bottom of the shirt. This is done on a machine of the "Over Lock" type which produces a "blind stitch" and is very elastic. The garment is then ready for the buttonhole machines. These are made by the Reece Button Hole Machine Co., Boston, Mass., Singer Sewing Machine Co., New York city and Standard Sewing Machine Co., Cleveland, Ohio. All of these types of machines are equipped with knives for trimming the threads automatically when the button hole is finished. The Reece machine uses only one thread and consequently makes a chain stitch. It is the fastest of the machines named, making nearly two buttonholes to one of the other makes. The company only rents the machines on a royalty basis, which equalizes the cost of operation to that of the others, hence the manufacturer has little choice of advantage except in the two classes of stitches.

The next step in finishing is sewing on the buttons. The Union Button Sewing Machine Co., of Boston, Mass., the Singer Sewing Machine Co., New York city and the Standard Sewing Machine Co., Cleveland, O., each make a machine for this purpose. The Union Button Sewing Machine Co., uses only one thread and claims many advantages over the lock stitch types. In both classes the threads are knotted, or tied and trimmed automatically. This is one of the most interesting sewing machines in use. One gets a good idea of its mechanical ingenuity by watching a skilled operator handle it as fast as she can pick up the buttons and insert them in the machine foot. This machine practically concludes the list of sewing machines for finishing the light weight flat underwear. The Union Special Sewing Machine Co., and the Metropolitan Sewing Machine Co., make special machines for sewing the button stays and facings to the shirts. Where the output of a mill is large enough to make full use of these special machines, it is advisable to purchase them. The Singer Sewing Machine Co., and the Standard Sewing Machine Co., have a machine for stitching the suspender straps fast to the drawer. These are really buttonhole machines, having special cams, and do not use the knives for cutting the buttonholes.

The heavy flat cotton underwear is made on these same machines, except the operation of seaming. Here the "Overlock" seams are too large and bulky, and one must resort to the use of the Dewees trimming and covering machines.

RIBBED UNDERWEAR.

The heavy and light weight ribbed underwear must be divided into two classes, namely, ladies' and men's, since each requires special machines. We will first take up the subject of men's wear rib goods. As this fabric is elastic it is not necessary to put cuffs and anklets on the goods except to make these parts more inelastic. In the case of a very light weight fabric, a tightly knitted cuff is sewed on (not looped). In most instances, however, the bottom of the sleeves, drawers and shirt are overedged on an "over-edging" machine. These machines are made by the same concerns who manufacture the seaming machines of the "Overlock" type. This edge is practically a selvage and will wear as long as the garment. The other processes for finishing are the same as for the light and heavy weight flat goods, except the seaming which on the heavier goods makes it necessary to use the Dewees trimmer and covering machines.

On ladies' rib goods one other machine is used to a large extent, being the shell stitch machine, made by the Merrow Machine Co., Hartford, Conn. It is of the ornamental stitch variety, producing a handsome finish around the neck and down the front of the garment.

The flat wool goods are finished on the same machines as used for the heavy weight cotton goods, except for the cuffs and anklets, which are always looped. Instead of hemming the bottoms of the shirt, a "boarder" is looped on. This boarder is made of rib cloth having a selvage edge and is knit just the right length and width for the several sizes of garments. The general description of the finishing operation, with respect to the sewing machines, is now concluded. Special machines are constantly being placed on the market for making the work more automatic, and our advice is to always give them a trial. The manufacturer of the machine is usually willing to put them in the mill on 30 to 60 days' trial, thereby giving ample time to investigate them thoroughly.

PRESSING.

We have now described the process that the underwear undergoes through the finishing machines, and we must select the proper method of pressing it. The goods, of course, have to be inspected before they are ready for the press. The old method of pressing was to use the hollow plate steam press, the garment being placed between suitable card boards, called "press papers." The card boards and garments were placed alternately, until a suitable bundle was formed. These bundles were then put into the press, and the steam turned on. The action of the heat and enormous pressure, pressed the garments far better and faster than was possible with an iron. This method to-day, is still one of the best. For wool goods, no steam is admitted to the hollow plates, as any heat would render the garments "boardy."

Another process of pressing is by using a machine which consists of a hollow rotating cylinder to which steam is admitted. Located around this cylinder is a movable apron, the goods being inserted between the apron and cylinder, and as the garment passes around the cylinder, it comes in contact with suitable rollers for making the necessary pressure. This operation is continued, and for those kinds of goods which do not require special straightening due to the cloth taking the natural twist of the yarns, very satisfactory results may be obtained. Ladies'

and men's rib goods may be pressed satisfactorily with this system.

Another machine has recently been brought out to do this work. The machine works on the principle of pressing and having steam in the direct circuit with the goods. This machine is especially useful when stitching the fold in the goods, just before they are put into the boxes. On goods of the balbriggan type, that are difficult to press sufficiently in a hot plate screw, or hydraulic press, this process is considered now, almost indispensable. Again, on the very cheap grades of cotton rib goods when no pressing at all is used on account of the cost, the manufacturer will find that this method improves the appearance of the garment at a cost of a fractional part of a cent per dozen.

The garments after pressing are then ready for the boxes, in which shape they reach the consumer. At this point, however, we wish to emphasize the absolute necessity of having the finishing operation performed properly, and particularly the pressing. While the goods may be of the low grade commonly called "junk," if this "junk" is pressed properly it finds a ready market. In a well managed mill, this detail of perfection in finish costs no more than the poorly finished product in a badly managed mill.

Quite naturally on the better and best grades of garments this perfection of finish is absolutely necessary, in fact in goods to be retailed at 50 cents per garment, and above, one expects to find as much detail of finish as he does in the quality of the yarns, etc. The jobber and retailer watch very carefully how the goods "open up," that is, the general appearance of the goods as they are taken out of the boxes. Even the average consumers are not so much interested in whether the goods are "all wool," "combed peeler," "combed Egyptian," or what not, as they are to see them well finished and pressed; in other words, as the trade styles it, whether or not the goods are "sightly."

With a new mill that has a reputation to establish, it can not afford to ignore the quality of its production, yet to the new mill this attention to the finishing detail is much more difficult than the old established underwear plant. With new processes, new help, and the anxiety to get the goods through the mill, the situation sometimes becomes a difficult problem. It is far preferable for a new mill to start out and not strive to build up a production at the expense of the character of its product, for it will take many years to live down the bad reputation of its first year's work. This very item has been the cause of failures in many mills. As previously stated, there is always a demand for good underwear of any style.

DYEING, BLEACHING AND FINISHING

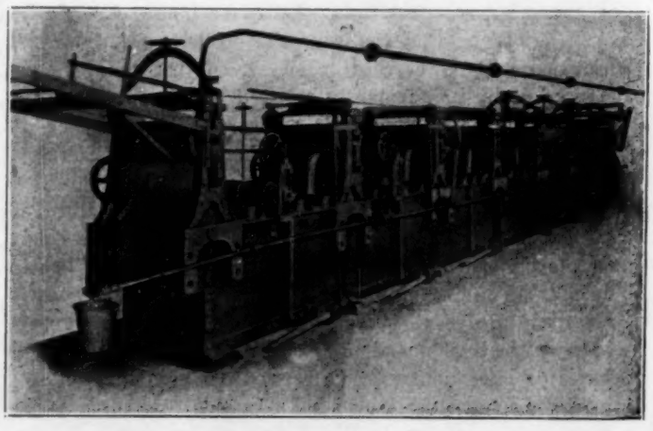
WARP MERCERIZING.

The mercerization of cotton in the form of a warp was much more an industrial success at the initial stages of the adoption of the process than was at first met with in the treatment of hanks, on account of the comparatively simplified nature of the mechanical contrivances needed. The arrangement of a warp-dyeing machine afforded with but slight modifications all of the conditions necessary in impregnating the yarn, as well as in maintaining the tension demanded. These modifications consisted essentially in the employment of guiding rollers of a much stronger form of construction and more firmly fixed in position, and in providing more efficient squeezing rollers.

So many other points called for attention, such as the provision of iron rollers and iron fittings within those compartments of the machine holding the alkaline liquor, and connected driving arrangements, that mercerizing machines were specially made for the treatment of warps, though without departing from the original type. This type forms the one in use to-day for the purpose. A series of these specially constructed compartments is arranged, one compartment in connection with the other, to form a rather lengthy machine. The sequence of the several operations varies with the circumstances. In some instances the compartments are so arranged as to provide for continuous treatment throughout with but one passage of the warps, while in other cases they are disposed so that the different operations are carried out on more than one machine.

Warps are subjected in two forms to mercerization, namely, in the rope form, and in the extended form which it assumes when wound on a beam. Fig. 1 illustrates a mercerizing machine for the treatment in the rope form. The first-named machine forms a series of compartments which provides for the impregnation of the yarn with the caustic liquor, then washing, souring, and washing, thus making a continuous operation. The special form of construction about warp mercerizing machines is confined for the most part to that portion of the series of compartments devoted to the impregnation of the yarn with the operation and the succeeding washing operation. These compartments are constructed of iron, and the rollers and all of their fittings that come in contact with the liquor are likewise of iron. Owing to the great amount of strain exerted on these guiding rollers they are made suitably strong to withstand it.

It is also at this stage of the treatment that other departures are made from the ordinary warp machine by driving not only the squeezing rollers, but also the top row of guiding rollers. One or more of these guiding rollers is caused to rest in movable sockets about midway



MERCERIZING MACHINE FOR ROPE WARPS.

between two pairs of squeeze rollers, as shown in Fig. 1, and is provided with a mechanical arrangement to raise or lower it at will, for the purpose of regulating the degree of tension placed on the warps as they pass through the machine. This device, however, is not the only means available for regulating the tension, nor is it the most reliable. The most successful and the most certain manner of regulating the tension is by having increased diameters of the bottom rollers of the succeeding sets of squeezing rollers. The diameter of the roller taking up the warps as they leave one compartment should be slightly greater than that of the one delivering the warps into the same compartment. Under this procedure the continuous tension is maintained whilst the warps are passing through the machine.

Very careful discrimination needs to be exercised in properly regulating the ratio between the diameters of two such rollers, and it does not suffice simply to have the face of one turned down to a somewhat lesser diameter than the other, for it is a notable fact that different qualities of yarn and different counts can not be successfully treated under the same degree of tension as it is controlled in this manner. Knowledge gained only by experience comes into play here, and the conditions are modified to suit the requirements by varying this ratio one way or the other by increasing or decreasing the diameter of one or the other of the bottom squeezing rollers, simply by winding more cloth-lapping around the roller or removing cloth. It will be readily perceived that a fine judgment is called for in such cases, yet many workmen concerned with this process possess it to a highly-developed degree, and experience no difficulty whatever in adapting the rollers under their care to all of the different conditions. The tension on the warps is also exerted in this way in the compartment of the machine where the mercerized yarn is first washed; in fact it is here that most care must be exercised, or either broken ends will result or a loss in length will be incurred, with a corresponding inferior degree of luster.

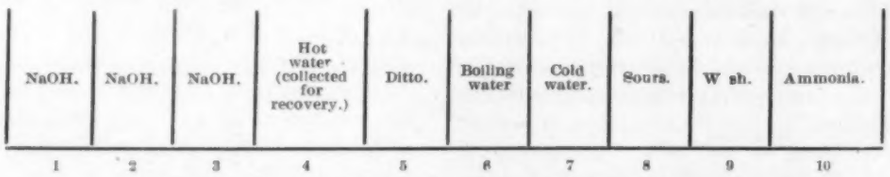


FIG. 2. DIAGRAM OF A TEN-COMPARTMENT MACHINE.

There is nothing of special note about the construction of the other compartments of the machine. All of the stock heads holding the squeezing rollers are, however, provided with a lever arrangement, so that the pressure may be easily and instantly released to allow of the safe passage of the knotted ends of warps. The number of compartments making up a machine varies considerably, being naturally controlled by the nature of the finishing operations, and also in some instances by the nature of certain preliminary operations. The question rests solely on the state of the yarn in hand, and whether it has to be finished in the grey, or is required to be subsequently bleached or dyed; consequently quite a number of procedures are possible. For finishing in the grey, the whole series of operations may be carried out continuously, say, in a ten-compartment machine. In this case an arrangement such as shown in Fig. 2 is used.

However, as it is not the practice in all instances to sour even for greys, provided as much as possible of the caustic liquor has been removed from the yarn, which is now the great aim for economy's sake, the machine may finish at the end of the seventh compartment. Moreover, seven compartments form a more convenient machine, and should the subsequent treatment of the yarn be varied, then the after-treatment, according to its nature, may be carried out on other machines. The nature of the preliminary treatment given to the warps also varies; in some instances it takes the form of previously boiling-out, whilst in others the warps enter the mercerizing liquor without any wetting out. In view of the fact that wetted warps dilute the liquor, and that this tendency has to be corrected by providing a liquor proportionately stronger, it is often preferred that the yarn should enter in the dry state. Many dyers regard the cost of first drying those warps which have been boiled out as quite negligible, though this opinion is not generally held.—TEXTILE RECORDER.

(*To be continued.*)

THE TECHNOLOGY OF COTTON

A REVIEW OF RECENT PROGRESS IN THE CHEMICAL AND MECHANICAL TECHNOLOGY OF COTTON AND OTHER CELLULOSE FIBERS.

(*Contributed exclusively to* COTTON.)

BY FREDERIC DANNERTH, CHEMICAL ENGINEER.

Although many suggestions have been made and still more patents have been taken out for textile processes since the dawn of the twentieth century, the fact remains that we have devoted most of our time during the last seven years to the exploitation of processes belonging to the previous century. Thus Vidal black for which a French patent was taken out in 1893 was the starting point for that now numerous class of coloring matters known as the sulphur or sulphide dyes. The low price of these dyes combined with the simple processes of application have brought them into popular favor with a bound. In spite of the interest which Vidal black created in its day it was not until 1896 that its successor,—Katigen black brown N (Elberfeld) appeared on the market.

The German patent taken out by Chardonnet in 1884 has led to the introduction of luster cellulose or imitation silk as a commercial article. Yet this industry is still in its embryonic state. The original patent for pyroxilin silk was followed in 1897 by Pauly's German patent for cuproammonium silk and in 1898 by Stearns' German patent for viscose silk. Ten years later we find but one viscose factory in the United States and the bulk of the imitation silk of commerce being made on the Continent. In 1894 Dr. Schreiner of Barmen, Germany patented the "finish" which bears his name. This method of applying a silk-like luster to cotton fabrics has reached a high state of development

within recent years. The Schreiner patent furnishes another example of the losses which an inventor may suffer because of defective patent specifications. The process consists essentially in passing the fabric through a calender, the upper roll of which is engraved with 5 to 20 lines per millimeter. If the roll is heated and a pressure of approximately 40 tons is applied a decided gloss is produced on the surface of the fabric. In 1895 Thomas and Prevost of Crefeld took out a German patent for the production of a luster on cotton by means of the mercerizing process. It might be added that although John Mercer of Lancashire had observed the action of caustic soda on cotton as early as 1846 no commercial use was made thereof until Thomas and Prevost noted the exact conditions which must be maintained in order to obtain the best results. Their patent was declared void in the German courts in 1898 and in the United States Circuit Court eight years later. Upon closer examination it will be seen that the process of mercerizing as well as that of schreinerizing has for its object an increase of the natural luster of cotton fabrics. The various methods of coating cotton with a solution of cellulose dissolved in Schweitzer's reagent are but other attempts at producing the same effect.

In 1897 Karl Heumann a chemist of the Badische Anilin und Soda Fabrik in Ludwigshafen accomplished the technical preparation of artificial indigo on an economic basis. Since that time the Farbwerke Hoechst have succeeded in producing this dyestuff by an entirely different method (Pfluger's modification of Heumann's "benzene" method). The numberless experiments carried out with indigo and its related compounds have resulted in the production of a red shade known commercially as Thio-Indigo-red (Kalle & Co.)

Each year witnesses the patenting of numerous methods and materials for water-proofing and fire-proofing cotton fabrics. The former methods are designed for the manufacture of raincloths, sailcloths and bookbinders' cloths, the materials used being the well known compounds of calcium, magnesium, lead and aluminium with soap. In addition to these, various oils, fats and waxes are made use of. In the preparation of fireproof cloths the silicates, phosphates, tungstates and aluminates find application.

In 1907 Fothergill suggested the use of tannate of tin for rendering cotton resistant to the action of the direct dyeing cotton colors. Schneider seeks to attain the same end by first nitrating the cotton as it has been found that nitrated cotton has very little affinity for the direct colors.

To turn to the scientific investigation of the cotton fiber, —H. de Mosenthal has recorded some observations on cotton and nitrated cotton in which he found the specific gravity of raw cotton to be 1.607 while the nitrated product shows 1.642 to 1.681. The specimens of ramie examined by him possessed the specific gravity of 1.57 *before* and 1.67 *after* nitration.

In 1907 Minajeff conducted a scientific investigation as to the causes of the increased affinity of mercerized cotton for dyestuffs. In the same year Haller examined into the action of the bleaching, dyeing and mercerizing operations on the structure of the cotton fiber.

Among the new preparations which have been brought forward during recent years and which find application in the cotton industries may be mentioned Monopol soap, Gum tragasol and Diastafor. Monopol soap is a sulphated castor oil in solid form. It is recommended for the preparation of finishes. Owing to the fact that this preparation forms *soluble* soaps with the lime and magnesia contained in hard water its use has been suggested for those cases in which such water must be used. It is for this reason that the addition of Monopol soap to the dyebath aids in the production of level shades. Closely related to this substance is a liquid preparation known as *Tetrapol*. This is chiefly a compound of sulphated castor oil with carbon tetra-chloride. The manufacturers claim for it many advantages over ordinary soap. Thus it is unaffected by acids and calcareous substances and has the power of removing mineral-oil stains from cotton goods. This latter property will undoubtedly make it a welcome material for use in knitting mills. It is non-inflammable, contains no free alkali, no chlorine and no soda. The fact that the preparation contains carbon tetra-chloride (boiling point 172 degrees F.) makes it necessary, however, to use dilute solutions and heat the bath only gradually. *Gum tragasol* is a product which is put on the market in the condition of jelly and is recommended as an adjunct to sizing mixtures. The substance is prepared from St. John's bread the fruit of the carob tree (ceratonia siliqua). Its peculiar odor is due to the presence of phenol which is added in order to prevent fermentation. *Diastafor* represents a concentrated extract of malt which finds application in the removal of starch from printed fabrics. Its use in this connection depends on the conversion of the starch (which is insoluble in water) into dextrin which is soluble in that liquid. If diastafor be added to a starch paste and the liquid be heated or soda be added before the starch is completely converted into dextrin, a pasty mass will be obtained. This reaction is made use of in the preparation of finishes by means of potato starch and diastafor.

In a class by themselves as it were stand the several hydrosulphite preparations which have been introduced during the last few years. Among these may be mentioned *Hydrosulphite* NF (Metz & Co.) used for discharging as well as for stripping, and Hydrosulphite AZ of the same firm recommended especially for stripping. These preparations contain somewhat less than 50 per cent. of sodium hydrosulphite-formaldehyde. Closely related to them is *Hyraldite* (Cassella) a zinc compound of sulph-oxylic acid. The marks "C extra" and "A" are intended for use on cotton goods. *Rongalite* which is put on the market by the Badische Co., since 1904 consists mainly of the sodium salt of formaldehyde-sulphoxylic acid. Like the other compounds of this type its chief value lies in the fact that it is a strong reducing agent. The meaning of the term "reducing" will be evident from the fact that these hydrosulphites (and sulphoxylates) are used for removing the coloring matter from textiles. As these preparations are made from easily decomposable substances great care must be exercised in the handling of them lest they lose in efficiency.

Rooms in exposed locations or on the north side of a building always require more heat than those more fortunately situated. These can be accommodated without making any change in the heating plant proper, by placing auxiliary coils in the main ducts leading to the points where extra service is required.

Cotton duck is the basis of rubber belting and all kinds of hose. Sales to these branches of trade amount to 50,000,000 yards annually. Millions of yards of cotton cloth are used in large cloth signs and advertisements.

PRIZE CONTEST LETTERS.

A COMPARATIVE TEST OF FIVE GRADES OF COTTON.

BY C. C.

Many experiments have been made in the past to shed light on the various processes and operations of cotton manufacturing; and from these experiments, many tables and books have been compiled that are at the present time accessible to the mill man. These books and tables have been of great value to him but why the authors of these experiments should, while covering almost every conceivable textile subject, fail to make or at least to record for the general good adequate tests setting forth the desirable or undesirable qualities of the different grades of cotton, is not known. It is a fact, however, that a careful search through a large number of reference books failed to reveal anything of this character. I am therefore compelled to infer that the importance of the effect of grade of cotton on yarn, and the vast bearing it has on the economics of the mill, are to some extent underestimated, or at least are not given careful research that is accorded to some other branches.

In an effort to supply in a measure this deficiency the experiments herein set forth were made a short time ago, and in casting about for a subject on which to write a letter it occurred to me that the results of this test would certainly be of interest to mill men generally.

The five different grades of American Uplands cotton were selected, namely, Strict Good Middling, Good Middling, Strict Middling, Middling, and Strict Low Middling; No. 10s filling and No. 30s warp were made from these different grades. The cottons were carefully graded by an expert grader and afterwards matched up to sample boxes from the New York Cotton Exchange. The tables which follow contain the results in such form as to make explanatory text almost unnecessary.

As is well known the above grades are based on the cleanliness, color, and bloom of the cotton, rather than the length of staple and quality of the fiber. This being the case the different lots would require the same machinery, and could be run under the same conditions. The latter factor was fully recognized as controlling to a large extent the value of a comparative test, and every effort was made to conform to it, no detail being considered small enough to be ignored. The humidity was the same at which the machines had been previously run. Only one machine was used at each process, each different grade being put through in succession. The card was well stripped out after each grade had gone through, before the next one was started. The machines were kept uniformly oiled and cleaned.

Tests were made for four things, namely, waste, breaking strength, evenness, and appearance, and the No. 10s filling and 30s warp were chosen in order to obtain a wide range of numbers. Tests for waste were made only on the pickers and cards, the loss in succeeding processes being considered negligible. The amount of waste was obtained by weighing accurately the amount of cotton fed into a machine, and then the amount received from it, as shown in the following tables. The three picking processes being considered as a unit.

TABLE OF WASTE ON PICKER.

Grade	Wt. Fed in	Wt. Delivered	Loss	Per cent. of Waste
S. G. Middling	102½ lbs.	96⅛ lbs.	6⅜ lbs.	6.21
G. Middling	117 lbs.	111⅝ lbs.	5⅜ lbs.	4.65
S. Middling	82⅝ lbs.	77 lbs.	5⅝ lbs.	6.94
Middling	128⅝ lbs.	121⅝ lbs.	7⅛ lbs.	5.53
S. L. Middling	146¼ lbs.	135 lbs.	11¼ lbs.	7.52

TABLE OF WASTE ON CARD.

Grade	Wt. Fed in	Wt. Delivered	Loss	Per cent. of Waste
S. G. Middling	35½ lbs.	34¼ lbs.	1¼ lbs.	3.52
G. Middling	38⅝ lbs.	37¼ lbs.	1½ lbs.	3.87
Middling	39¼ lbs.	38⅛ lbs	1⅛ lbs.	2.7
S. L. Middling	38½ lbs.	36⅝ lbs.	1⅞ lbs.	4.87

The percentages of loss were figured by dividing the loss by the weight fed in.

When the yarns were spun, six bobbins from each grade, —three warp and three filling—were selected, skeins of 120 yards reeled from them, carefully sized, and then tested for breaking strength on a power testing machine. The results are recorded in the table of breaking weights which follows:

TABLE OF BREAKING WEIGHTS—30s WARP.

Grade	Length Staple	No. Yarn	Breaking Strength in Pounds Skein No. 1	Skein No. 2	Skein No. 3	Average Strength
S. G. Middling	1"	30.39	60	60	68	62.6
G. Middling	1"	29.69	72	63.5	68	67.8
S. Middling	1"	28.72	62	62.5	65.5	63.33
Middling	⅞"	31.31	41	51	43	49.6
S. L. Middling	1"	31.26	61	50	52	54.3

TABLE OF BREAKING WEIGHTS—10s FILLING.

Grade	Length Staple	No. Yarn	Breaking Strength in Pounds Skein No. 1	Skein No. 2	Skein No. 3	Average Strength
S. G. Middling	1"	9.82	175	161	169	163.33
G. Middling	1"	10.11	234	240	220	232.33
S. Middling	1"	9.75	180	228	202	203.33
Middling	⅞"	10.17	162	126	156	146.66
S. L. Middling	1"	9.64	190	186	154	177.33

In looking over the tables it will be noticed that some remarkable results have been obtained. Although the Strict Good Middling was the best grade, it is found that the Good Middling had taken first place in point of desirability in both waste tables and those for breaking strength. A possible explanation of this is that the S. G. Middling in order to receive that grade, was probably picked out at a time when the plant was green, there being less dry leaf at that time, and it would therefore contain a larger percentage of immature fibers, thus not only making more waste but weakening the yarn.

Again, it was hardly to be expected that the Strict Middling would make more waste than Middling. This can only be explained by the probability that the latter cotton was grown in a different section to the other cottons, as evidenced by its length of staple. When the table of breaking weights is examined it is found that the Strict Good Middlings are inferior to both the Good Middlings and the Strict Middlings, which tends to strengthen the theory of early picking. The fact of the Middling breaking lower than the Strict Low Middlings is easily understood by a comparison of the length of staple of the two fibers, the Middlings being only seven-eighths of an inch while the Strict Low Middlings are one inch. Allowance must also be made here for the fact that the yarns from the Middlings were slightly finer in number.

Referring again to the breaking strength of the Strict

Good Middlings it might be pointed out that while yarn from this cotton is slightly finer in the 30s than that from the Good Middling, it is at the same time slightly coarser in the 10s. The tests for evenness and appearance could not yield any very definite results, there being no positive way of determining these questions. A close examination of the different yarns seemed to show that between the S. G. Middlings, the Good Middlings, and the Strict Middlings there was very little difference, these being slightly superior to the Middlings and the Strict Low Middlings, which were also very close together, the difference between these two groups being rather marked as to color.

KINKS FOR CARDERS.

EDITOR COTTON: I have read with interest the articles in your issue of January, 1910, by J. C. Tipton on "Carder Troubles," and "New Cotton in the Mill" by C. H. Edmondson. Under the rules I suppose I can take up only one subject at a time, and in one article. But these two articles present some suggestions that indeed make trouble for a carder that we old heads never encountered. All of us have met and overcome unevenness in yarns, but this unevenness in cotton mills does not often come from the cotton alone, such as J. C. T. mentions.

I suggest to myself that the conditions Mr. Tipton mentions as to the changes in cottons delivered to the picker, is in some Southern mill, where they purchase their cotton direct from the gin, without compressing and perhaps without even baling, and that the buyer of the cotton takes anything offered, paying no attention to grade, staple or color. If this be the case, then it must be a print cloth mill that cares little for its reputation. If in this case the mill buys only from hand to mouth, or what it uses from day to day, there is indeed trouble not only for the carder, but for all hands through the mill. But I can hardly make myself believe that such is the case. However, if the carder has this to contend with, if he is up to his business, he can handle this kind of cotton, so that it will give him little trouble, while going through the carding department, but the spinner and weaver may not get the results they would with better stock.

Keep your pickers clean and in good order at all times, and make your laps the standard weight; don't change the weight here for any reason. Keep it standard on all the grades put through. On the breaker picker do not fill your hopper feeder too full, nor let it run too low, that is to say, never fill it as full as possible, nor let it run below one-fourth full; in this way you do not overload the lifting apron so as to retard it, nor do you let it get so low that it feeds light. Keep the inside of the machine clean around the beater shafts, and do not let it load up with oil and dirt, so that it cakes on the sides. If you rub the beater blades and grid bars with whiting twice a week so that the cotton and sand do not stick anywhere, this machine will make a good even lap for the intermediate and finisher pickers.

Do not neglect these two machines, but keep them equally clean. Having them clean inside is of more importance than the outside. If the evener is kept in order, one will get a good even lap all the time, no matter what kind of cotton is given you to use. As a rule no carder has the selection of his stock but must use what is given him, and the carder that uses the poorest stock, and gets the best results is the best man. And I here would suggest that the carder should not be always finding fault with the stock, but take it and get the best results possible, and if he is up to his calling, he will make good work from poor cotton, but of course not as good as from better stock. Never lay all troubles onto the stock; there are many places in the carding department where poor roving can be and is made, that is the fault of the carder and his head men under him.

If you are using the English system of carding, see that your drawing on the first head is of standard weight, and watch it closely until it is completed on the fine speeders, and if it is done right, the carder will have nothing to explain. If the American system of carding is being used, the weighings at the railway heads should be watched closely. Now I am going to say something that will not please all of the carders in the country, and may not please any. But it is this: Many of our carders take their orders from their superintendents and give them to their second hands, and then give them but little if any attention afterwards. And as a rule the second hands pass the orders along, and give them no more attention. I have told my overseers many times that if telling the help once what to do and how to do it, was sufficient, I would not need any overseers, as I could go around once and tell them what I wanted; but we all know that this does not answer.

In order to get things done, and done right and kept so, the overseer and second hand must keep an eye on the help all the time, every day, week in and week out. This does not mean that we will have to speak to the help every day about certain things, but rather to look and see that the help do these certain things they are told to do, and if they do, all well and good; if they do not do as told then correct them, once, twice, yes! a hundred times if necessary. If the overseer gives his directions in a pleasant way, he will get his work done right and on time. This is one of the ways to get good work from poor cotton; see that the help do right, and as told. Another way to get good work from poor cotton is to see that the machines are in the best possible condition all the way through the carding department. It is not enough that a machine is running well, but see that it is making the best work possible. I have seen speeders running but making such poor roving that it was a source of much trouble to spin it. Ask nine carders out of ten if their speeders run well, and they will tell you yes, very well. Then ask the spinner if his work runs well, and he will say yes or no. About one-half of the spinners say no, because he fears the carder will not be as careful, if he says it runs well.

Now much of the poor spinning is caused by the speeders. While they may look as though they were running well, and the carder tells you they run all right, yet they are not making as good work as they ought and why? The carder says they are geared just alike, and he sees no reason why they should not all make equally as good roving. They may all be geared alike, but does the cone belt start at the same point on all of the machines? I venture to say that they do not in but few carding rooms, and if they do not, the roving is not all alike. I have been in carding rooms, where the carder would say that his speeders were all geared alike, and the cone belt would be 2 inches out of the way in some cases. Some of the speeders were running with the roving just a little too

slack, and many of them running with the ends too tight, but both running well so far as could be observed by an ordinary carder. But the trained eye would see the difference at once, and so would the carder when his attention was called to it, but he would remark, "these speeders are all geared alike." Yes, but they had gotten out of of order by the improper winding up of the cone belts. These belts get out of position by bunting too hard against the collar and loosening it, and this comes so gradually that no one but the speeder tender is bothered. If the ends draw too tight so that they break too often, the tender changes the position of the cone belt to make the ends run a little slack. This single speeder would have roving on a single bobbin that would make yarns vary ten numbers. Now if any carder can truly deny, or say that he never has seen this, then he has not seen all of the ins and outs of the business.

To avoid having the speeders make this kind of roving, I would suggest that all speeders be made to start with the cone belts 3 inches from the ends of the cones; set the collar to this position; have two set screws in the collar; and drill the shaft to receive the points, so that when winding the belt back after doffing, the bunting against this collar can not move it. The cone belts will then always start from the same position. Look at them occasionally, however, and see that they do not move, as this is one very important place. Carders troubles come and go, and if he is alive, and is looking after his work, he will not have as many troubles as he may think. But above all things, don't find fault with the cotton, when your department is at fault, and be sure that there are no stones lying around with worms under them for some one else to find, for as sure as one lives, the true cause of a mill running poorly will come to the surface sometime, and often in an unexpected manner. The careful carder does not leave all things to his second hand, but shares the work. He should when on deck look after his help, the second hand keeping the numbers correct, and the repairs of the machines always in good order. The overseer by looking after quality of his work and seeing that the double and single roving is little, or none, will have few "Carders Troubles." *Manager.*

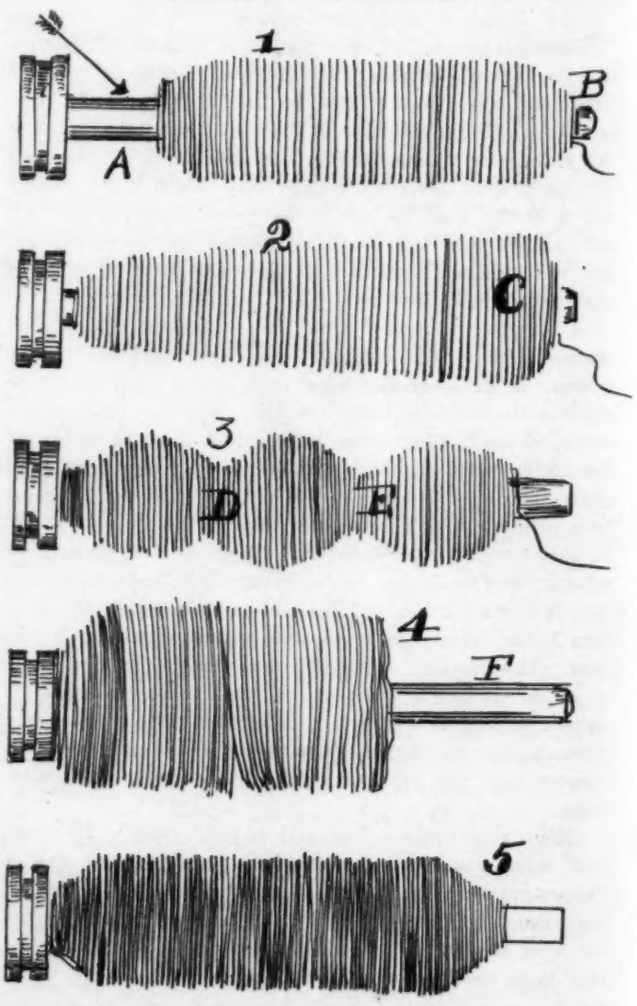
SOME CAUSES OF TROUBLE.

BY G. B. M.

The August number of Cotton contained an article by George Rice on "Faulty Bobbins," which is very good, but I do not think he goes deeply enough into the subject, and I am going to offer a little information to supplement his contribution.

What he says about the yarn in Fig. 1 being wound too high up on the bobbin is very true, but he does not tell what the cause of this fault is on a spinning frame. On a spinning frame such a bobbin may be caused from the chain that connects the builder with the rocker arms being too long. This chain is fitted at one end with a rod which has threads cut upon a portion of its length, which allows the chain to be taken up to any desired length. But sometimes the frames run so long and the joints of the chain become worn so much that even after the take-up nuts have been run as far as they will go, the chain is still too long, and the traverse starts the build too high up on the bobbin. In this case it is necessary to take the chain out and cut out from one to three links, and then set the traverse so that it will start the build very close to the bottom of the bobbin.

What was said about Fig. 2, that is, that slack bands are the cause of soft nose bobbins, is also true, but this is not the cause that gives the weave room the most trouble. When a band is slack it not only makes the bobbin soft, but the yarn does not have the required amount of twist in it and is very tender. In most cases it is so weak that the weaver easily discovers it, and therefore does not put that bobbin into the loom at all, but throws it out into



Faulty Bobbins and One Perfect Bobbin.

the waste or bad filling box. The real trouble is brought about where the bobbins are soft, and yet the yarn contains the required amount of twist, and so far as the yarn is concerned it is just as strong as the average yarn. The cause of this is generally due to the spinner using a lighter traveller than should be used on that number of yarn. A light traveller will put in just as much twist as a correct traveller would, but will fail to wind it as firmly on the bobbin, and this causes it to be easily knocked off by the picking motion of the loom.

There is another variety of faulty bobbins that sometimes give considerable trouble in the weave room, in which the yarn seems to be comparatively firm on the bobbin and also contains the correct amount of twist, but

the traverse will make a considerable pause or dwell while at the top of its course. This will allow the yarn to pile up slightly at that point, while at all other points it will be wound evenly and correctly. This pile of yarn prevents the yarn from taking a firm hold of the bobbin and it is therefore knocked off by the picking motion of the loom. This dwell of the traverse is usually caused by a considerable play or lost motion in the train of gears that drives the builder cam. This trouble may also be due to a lifting rod becoming slightly tight. There are some frames built with the ring rails heavier than the balance weights, such as the Howard & Bullough frames, and on this kind of frame the above named trouble may be caused by the point of the builder cam becoming worn, thus causing the ring rail to dwell too long at the top of its traverse.

One thing that causes the weaver much work and annoyance is the small amount of yarn that is sometimes placed on the bobbin. A few years ago the writer was employed in the card room of a large mill in Alabama, and one day business of the room required him to go up into the spinning room, and as usual he saw the little doffers, the section men and every body else getting about at a lively rate. They were pushing the machines for all there was in them, but the writer noticed that all of the bobbins were very slim or small in diameter and in most cases lacked from one to two inches of being full at the top. While passing through the room he came in contact with the second hand and asked him what his object was in making the bobbins so small, and he said they were doing that to keep ahead of the weave room. I did not offer this man any suggestions because I knew that he resented any advice from anybody, but I could not help thinking that the weavers at that mill must be having a hard time.

A filling bobbin should be built just as large in diameter as the shuttle in which it is to be placed will allow. Of course, it should not be made so large that it will press against the sides of the shuttle, but should fit snugly in the shuttle, and the yarn should be wound on it as low at the bottom as possible without coming in contact with the rings, and should be filled up to within one-half inch of the top. To make a long story short, every yard of yarn should be put on a bobbin that can be properly woven off by the shuttle, and the mills that do this and at the same time give the weavers good warps will never fail to get the best production as well as the best quality of work.

WHAT TEXTILE JOURNALS SHOULD BE.

BY C. E. B.

Textile journals are divided into two distinct classes, and are intended to cover two entirely different fields. First, we have the weekly journal which should be very closely allied to the daily trade newspaper. This journal is the one which is mostly desired by the man in charge of the financial end of the mill's business. It should contain all of the latest market quotations, reports on the condition and tone of the market, also reports of actual sales of yarns and cloth, giving the grade, quantity, and quality of orders recently placed which may be of special interest. The latter item is one which will oftentimes be of considerable value to a person who is interested in selling the product of a mill.

It should also contain an account of the growth and condition of the cotton crop, during the proper season, stating the conditions existing in the different sections of the cotton belt and the kind of weather desirable in order to favor the plant. A well informed mill man should have a general knowledge of these conditions, and having this information he is much more capable of forming a correct opinion as to what will transpire from the results of any kind of weather, or disaster. As the fluctuations in the goods market are principally caused by the advance and decline of the raw material, the weekly journal should give all the information available along this line.

Editorials and articles written by practical and well informed men, on any subject bordering on the commercial end of the business which at that particular time may be of special interest, are always welcomed. The weekly journal should also contain all the news items of interest to those connected with the textile industry.

The mainstay and support of a monthly textile journal is, and will continue to be, the technical articles it contains. The monthly journal appeals principally to superintendents, overseers and the men in charge of the different machines found in a mill. As a rule these men are more particularly interested in articles dealing with calculations, processes, adjustments, care and production of the machinery, than they are to knowing market conditions. This is because their responsibility ceases when the mill has turned out the largest possible production of the proper quality, at a minimum labor cost.

No person can keep well informed on trade conditions from a monthly journal, because it is not published often enough. However, many readers who keep themselves well informed by reading the daily and weekly trade papers like to have a review of the occurrences of the past month, which appear in the monthly journal. This should be written as briefly and concisely as possible, going more into the details of the points which have been of most interest. This will also inform the man who does not read the dailies and weeklies, of the general happenings of the month and give him a correct idea of the general condition of the markets.

As a rule a monthly journal carries more advertisements than a weekly, which is an interesting feature to the average reader. I never read a journal or magazine in which I do not look through its advertisements, because there we find the latest developments and improvements in machinery and appliances, which enable a mill to be operated more profitably and successfully, and I do not believe that I am an exception to the general rule.

THE SUPERINTENDENT AND OVERSEERS.

BY W. M. S.

As a cotton mill man, which I have been for the last 14 years, I am writing a few words in regard to management, as I have sometimes been managed in the right way in the mill and again in the wrong way. First, a mill should have a president who will look after his help as much as he does his mill. His superintendent should be a practical cotton mill man who knows what a job is for an operative, and a man who will live in the village with his help. Such

a manager will see to it that good people live in his village, and that the bad ones are soon gotten out of town. If all superintendents would do this, you would see the mills in this country move along much better than they are at this present time.

The superintendent's duty also is to get overseers who are good men; men who walk and talk to one of his hands just like he would to one of the others. This is the great trouble to-day with the cotton mills in the South; mill hands are moving almost every day, and I find the trouble is that some of the overseers or superintendents have shown partiality among them. We have, of course, many operatives in the cotton mills in this country who are hard to get along with, and the overseer can not treat them as he does those who are more tractable. In a case like that, a good overseer will not waste his time with such help. Now if an overseer treats the bad help better than the good, the good help will surely find it out and trouble will follow. I consider one good hand better than two trifling ones. If the superintendent of the mills will get good help the mill would prosper. I have seen help who would break up the machinery just for pure meanness and some overseers will pay many of them as much or more than the good ones. Contrary hands cost the mill many times as much as they are worth to it.

HOW TO GOVERN THE EMPLOYEES OF A MILL.

BY H. A. M.

One of the first things that we must look to in the management of a mill are reliable and trust-worthy men at its head; men who possess kindness and good-will toward their fellow-men, and at the same time are determined in their views as far as their business is concerned. There must be someone whom the employees can respect and have confidence in.

A mlll should be controlled by love and esteem, instead of by fear and hatred. You must study the nature of the different employees and treat each one accordingly. You will always find that kind words will have greater results than harsh methods. Of course, there are exceptions to this rule, as the employees themselves may cause you to reprimand and even discharge them for some rash act or deed. On the other hand, if employees always act and speak in the interest of their employer they will be more solidly bound together, and there will be no necessity for any incident to arise to mar the successful management of the mill.

THE RESTLESS MIND OF THE GENERAL CLASS OF COTTON MILL HELP.

BY J. F. H.

This may not appear to be a very appropriate subject to discuss in the columns of COTTON, but nevertheless it is a condition that may be noticed more or less in any section of the country where cotton mills are established.

First, we will begin with the plow boy or girl out of the cotton patch, just from the country; they will come to the mills either expecting at the very beginning to turn off as much work as the old experienced hands, or to open their envelopes on pay day and find in them just as much as an experienced hand has who worked next to them; and in nine cases out of ten they will go home and tell their parents that they were not treated right, because if they had been they would have drawn more money. The man of the family will then say in presence of his children: "That is not what was promised us, so we will give them another trial and if it is not better on next pay day we will leave this mill, as a man told me this morning that he was going to quit here and go to such and such a mill where they paid more and it was a much nicer place. And thus the young minds of his children begin to absorb the idea of changing places continually.

If parents would not thus encourage their children before looking into matters of this kind thoroughly there would be better mills, better villages and better people. Furthermore such help would be more efficient and produce a higher class of work; a dissatisfied operative will not do good work. Show me a mill where the same operatives have remained for years and you will see the tenant houses in good shape, nice yards, etc., and you will find the mill turning off good work. I will refer you to the old saying of Patrick Henry "United we stand, divided we fall."

If the mill men of to-day would discard and reject the applications for work from all of that crowd known as "bum" help, we would see a great change.

POINTS ON SPINNING.

BY B. W. B.

The making of good yarn calls for attention to many details. First, the stock must be suited for the purposes; otherwise good yarn can not be made. The top rollers on the spinning frame should be well covered; a badly covered roller will cause bad running spinning and this means poor yarn. When these rolls become fluted or channeled, they should be removed and replaced with new ones. The top and bottom rolls should be kept well oiled, and the oil should not be allowed to get on the cover of the top rollers, as it will not only shorten the life of the roll but will soil the yarn which would be a great injury to the finished yarn. If the top rolls are allowed to become dry at the bearings they will drag, and their speed will be reduced, resulting in producing yarn coarser than it ought to be. This lack of oil will also cause the roll to make rough, fuzzy, and uneven yarn, and also cause excessive waste and low production. Waste gathering at the ends of the top rolls and forming hard cakes will produce the same effect as a dry roll.

Creels should be kept clean, otherwise the lint will gather around the roving shewers and cause an additional strain on the roving, which will cause uneven and weak yarn. The roving trumpets sometimes become choked and will produce an uneven and weak yarn. The weights on the top rolls should be the same on every roll. The levers should be level and all in the same relative position in order to obtain the best results. The spindles, rings and thread guide wires should be set in the right position, and the proper weight traveller used if good running spinning is to result.

Cotton is used in the mining and marketing of coal. About 15,000,000 yards of cotton duck annually are made into coal bags.

MARKET REVIEWS.

MONTHLY REVIEW OF THE COTTON MARKET.

BY H. & B. BEER, NEW ORLEANS.

The advance in the price of cotton culminated with the opening of the new year. It was generally expected that there would be an urgent demand for the remnant of this season's small crop after the holidays, but the public was doomed to disappointment. Instead of the inquiry becoming more pronounced, spinners showed less disposition to buy, and as the future markets were inflated, the market having been over bought, realizing set in, continued from day to day and so undermined the market as to make the undertone decidedly weak. Selling to liquidate and to hedge contracts as well as spots finally developed a serious situation, especially at New York where extensive lines of long contracts had to be cared for in order to check the declining tendency of the market. A loss in values of more than 3 cents per pound, or about $15 per bale was witnessed within about one week.

There was nothing in the statistical position of the staple to warrant such a bad break in prices, as the movement to the ports continued on a small scale, and the periodical reports of the Census Bureau were in keeping with the Government's small estimate of last December, which promised an actual growth of about 10,088,000 bales. At the new low levels established, advantage was taken of the opportunity by spinners to protect their future requirements by buying of futures and spot cotton in a most liberal manner. The minor spot markets in the South reflected the unfavorable turn in affairs and a great deal of distressed cotton was parted with, but the leading points of distribution, namely, New Orleans, Memphis and Savannah held comparatively steady as a result of holders refusing to meet the sharp decline, ruling generally nominal for more than a week. At the moment the situation, while more encouraging, remains unsettled. At any rate exporters are unable to pay prices exacted, and buyers and sellers are remaining apart.

Trade reports in the United States remain favorable, however, the steel industry being in such good shape as to permit the United States Steel Corporation to declare an extra dividend of ¾ of 1 per cer cent. on its common stock, its earnings for the last quarter ending December 31 last having been $34,000,000, which is a splendid showing. Recent cables from Liverpool report trade in England to be improving, and now the election in the old country has passed into history, there may be more actively in a business way in the British Isles. There is the fear, nevertheless, that some of the big corporations in America are not living within the law, and as their existence depends to a great extent on the decisions to be rendered, probably at an early date, by the United States Supreme Court at Washington, there is much uncertainty in Wall Street, lest business be disturbed on that account; otherwise the outlook for continued prosperity seems assured.

The United States Bureau of Statistics has just issued a statement tabulated as follows:

SUPPLY.

U. S. Stocks held Sept. 1, 1909	1,483,585 bales
Ginned from Sept. 1 to Dec. 31, 1909	9,259,085 bales
Net imports Sept. 1 to Dec. 31, 1909	48,784 bales
Total supply to Dec. 31 by U. S.	10,791,454 bales

DISTRIBUTION.

Consumption, U. S., North and South to Dec. 31	1,747,244 bales
Exports from U. S. 4 months ending Dec. 31	3,774,714 bales
Mill stocks, North and South, Dec. 31	1,597,187 bales
Stocks in independent warehouses Dec. 31	2,548,702 bales
Stocks elsewhere	1,123,607 bales
Total	10,791,454 bales

The salient feature of this statement is the fact that it shows American mills to have consumed 1,747,244 bales during the first four months of the season, which is indicative of about 5,242,000 bales for the season against 5,060,000 bales consumed in the United States last season. In other words it looks as though the North and South will consume about one-half of this crop, leaving only about 5,000,000, plus about 1,500,000 held in reserve at the opening of the season, for Europe to draw from to satisfy its present day minimum consumption of about 8,000,000 bales of American cotton. From a statistical point of view the position of cotton is very strong and another advance is likely.

THE YARN MARKET.

The conference of Southern spinners in Charlotte, N. C., during the early part of January attracted considerable attention in the yarn market, owing to a resolution passed by the meeting setting forth a schedule of minimum prices for soft and hard yarns. New York quotations did not conform to the prices named in the resolution, but were generally one to one and a half cents below the Charlotte figures. The resolution was not binding on the spinners, except morally, but it was generally understood that the schedule would be followed. After the meeting some rumors in New York were to the effect that some of the spinners were making contracts at the time of the conference at prices one-half to one cent below the schedule. This was evidently a bear argument, and an effort to destroy confidence in the sincerity of the conference.

The market continued to feel the effects of stock yarns that could be sold at concessions and still net the dealer a profit. Much of this yarn was consigned last fall when prices were lower, and dealers are ever wont to take their profits for fear of a recession that will cancel these paper gains. The mills can only hold themselves responsible for the presence of stock on the market, owing to their disinclination to curtail at the proper season. As long as the supply lasts it will continue to have a depressing influence upon prices.

The severe declines in the cotton market during the month had a bearish effect upon the prices of yarns, and the wide fluctuations from day to day produced a very unsettled condition in the yarn division. There were a great many mills, however, which were not induced to shade prices on account of the decline, their argument being that the new level of cotton offered them but little profit on their product at the prices asked. On the other hand, some buyers were using all of the bear arguments at their command. They contended that the small concession in quotations was only a beginning of a decline that

would later on permit them to fill their requirements at much lower figures.

Very little business was put through during the month, either in warps or knitting yarns, and it is the general opinion of dealers that the stocks in the hands of the buyers are very small. The business that did eventuate produced a more or less irregular market, and particularly in the finer counts. Instances were noted during the month where 50s two-ply had a quotation of 41 cents, but were bought for 40 cents, and while 40s two-ply were held by some for 36 cents, others were willing to accept 35 cents for quantities. The lack of sufficient orders and the continued operation of the mills have brought many of the spinners to the point where they feel the necessity of consigning their product. Spinners have avoided taking this step for the past few months, in the hope that the turn of the year would bring more orders.

THE KNIT GOODS MARKET.

Comparative quietness characterized the market during January, due to several causes. Jobbers were taking inventories and getting their books in shape for the year; the slump in cotton with its unsettling influence affected sentiment in the knit goods division; and groundless rumors in the daily papers to the effect that knit goods prices were to be advanced 25 per cent. had a deterring effect.

Owing to the unusually cold weather throughout the country, fleece-lined goods had very satisfactory sale, even at the advanced prices over last year's figures. For the same reason wool and worsted goods have fared well in the market. Plain goods for fall delivery were also in fairly good demand in the early part of the month.

Although prices on most of the lines were advanced over the figures of the previous season, sellers were practically a unit in the opinion that the goods are marked too low, compared to prices of cotton and yarns, and that the jobbers who are not taking advantage of present levels will live to regret it.

The meeting and dinner of the Knit Goods Buyers' Association in New York on January 17th was attended by a large number of buyers, some of whom took occasion to make purchases while in the city, although the extent of this demand was not as large as anticipated. Many inquiries were made and notes taken on prices, etc.

A falling off in the demand for plain goods was noted at the end of the month, but a good business in this line is anticipated later on. Sellers generally regret that the report should have been published in the daily papers that knit goods had been advanced 50 per cent. over last year's prices and were to be further marked up to the extent of 25 per cent. While the trade was well aware that the report was absurd, yet its influence could not but hinder business to a certain extent, on account of the general protest against high prices of necessities.

The end of the month found jobbers and department store buyers doing practically no buying, but rather watching the developments in the cotton and yarn markets. Sellers have not enjoyed this lack of interest, but they feel confident that a scramble will occur later on when all buyers will want to place orders at the same time, and they are of the opinion that some one will be inconvenienced.

The Textile Mill Situation in the South and New England.

SOUTHERN MILL SITUATION.

(Special Correspondence.)

The two topics of paramount importance to Southern cotton mill men during last month have been the sensational fluctuations in the cotton markets, the effect thereof on prices of manufactured goods, and the effort of manufacturers to bring about an improvement in the prices of cotton yarns by the adoption of a uniform price schedule. As might have been expected, on account of the exceedingly vacillating nature of the cotton markets, cotton yarn markets have been more or less demoralized, with prices irregular and uncertain. Dealings have been on a somewhat narrow scale, and the entire trade has been in a state of suspense. When cotton ultimately reaches some firm status, it is the confident belief of spinners that prices on manufactured goods will improve speedily and substantially.

The most important meeting of the past month was that held in Charlotte, when some 150 soft and hard yarn spinners of the South met with numerous commission men of New York, Providence, Philadelphia, Boston and other Northern cities, and agreed upon a uniform schedule of prices. In a resolution which was unanimously adopted at this meeting, it was urged upon spinners to curtail production heavily unless they could secure the prices agreed upon. In times past much injury has been done to business by irregularity in prices, made by different spinners, some offering stocks much cheaper than others. The necessity of some concerted action, on uniform scale of prices, seems at length to have been fully appreciated.

The agreement is of a moral nature. The point stressed most was that spinners hereafter study cost of production and base their sales on same, rather than to accept prices in a haphazard manner.

NORTH CAROLINA.

Despite unfavorable conditions prevailing in the textile industry during the year 1909, remarkable progress is shown in reports just submitted to the North Carolina Commissioner of Labor and Printing. Here are some of the more important facts reported during the year, which will be embodied in an elaborate report, to be issued later on: Cotton milling interests represent more than one-third of the entire manufacturing capital of the State. For the year 314 mills reported to the Bureau of Labor and Printing, 65 of the number being knitting mills. Increase in working capital reported by these mills aggregate $5,100,000.

Reports from 233 of these mills show a consumption of raw material amounting to 271,206,624 pounds of cotton and wool. Eighty-one of the mills did not include raw material used in their reports.

More new mills were chartered in North Carolina during the past two years than in any other state of the Union. Reports of the cotton mills generally to the Department of

Labor and Printing show a reasonably good year in spite of unfavorable conditions against which cotton milling interests of the whole country were pitted during the greater part of the year.

SOUTH CAROLINA.

Similarly gratifying progress has been made in the cotton mill business of South Carolina, according to reports submitted to the Commissioner of Labor, vital facts having just been given out.

Here are important facts touching on the textile industry exclusively: The amount of capital invested in textile plants of South Carolina at present is $62,537,289. Amount invested in 1907 was $54,987,450. Value of the product of the textile plants in 1909 was $67,401,332.

A study of the progress made by the textiles of the state is shown in the following comparative statements: In 1905, there were 2,864,092 spindles and 72,702 looms, by 1907 these totals had increased to 3,688,761 spindles and 90,177 looms; and by 1909 there were 3,846,117 spindles and 96,281 looms.

There was a falling off in 1909 of the number of bales of cotton consumed by the mills in the State, due to the fact that many of the mills have changed from the manufacture of coarse to finer goods, thus turning out a product that requires less material for their manufacture. There are 49,731 textile operatives in the State, as against 38,329 in 1905. The total population of the mill villages is 110,000. The amount of wages paid to textile employes, not including the salaried men of the different companies, was about $12,000,000 for the year, against $8,000,000 in 1905.

Cotton mills of Charlotte, N. C., and vicinity experienced a good year's business in 1909, as following reports of dividends just declared will show: Highland Park Mfg. Co., 5 per cent. semi-annual on $500,000 capital stock; Elizabeth Mill, 5 per cent. semi-annual on $100,000 capital; Henrietta Mills of Charlotte and Caroleen, N. C., 5 per cent. semi-annual on $675,000 capital; Chadwick-Hoskins Co., which operates five mills, namely, the Chadwick, Hoskins, Louise, Dover and Calvine, declared during the year 6 per cent. on the common and 7 per cent. on the preferred stock. Capital stock is $2,000,000 and represents an equipment of 97,000 spindles and 2,200 looms.

The $300,000 paid out at Greenville, S. C., in January constitute the earnings during the past six months, except in the case of the Piedmont Mill, which earned its quota during the last three months of the year. To be specific, mill dividends paid out in Greenville and vicinity aggregated $284,820.

It is a noticeable fact that six out of the fourteen mills reported below paid out more than ever before, and not one paid less than last year. Of this number only two did not earn a larger per cent. on their capital. This was due to the fact that capital of each was increased. The American Spinning Co., the Poe Mills and the Glenwood Mills increased their dividends from four to five per cent., and the Mills Mill from three to three and one-half. Woodside and Brandon mills did not increase their dividends but added to their capital during the half year since dividends were last paid. The McGee Mfg. Co. will not pay any dividends at this time.

The following semi-annual dividends were paid by mills of Greenville and vicinity: American Spinning Co., 5 per cent. on $600,000; Brandon Mills, 3 per cent. on $850,000; Mills Mill, 3½ per cent. on $352,400; Woodside Mills, 3½ per cent. on $600,000; Monaghan Mills, 4 per cent. on $700,000; Poe Mills, 5 per cent. on $500,000; Carolina Mills, 3 per cent. on $150,000 common; Piedmont Mfg. Co., 3 per cent. quarterly on $800,000; Shoals Mills, 3½ per cent. on $52,000; Pelzer Mills, 5 per cent. on $1,000,000; Easley Mills, 5 per cent. on $500,000; Victor Mills, 4 per cent. on $500,000 common and 3 per cent. on $200,000 preferred; and Glenwood Mills, 5 per cent. on $250,000.

Stockholders of the Dacotah Mill Co., Lexington, N. C., have met and re-elected all the officers. C. A. Hunt, Jr., is president. It is thought that the mill will be ready for operation by the 15th of February. It has 9,600 spindles and 240 looms. Stockholders of the Long Island Cotton Mill Co., met recently at Long Island, N. C. The company's business for the past year was very satisfactory. George H. Brown, of Statesville, N. C., was elected president.

NEW ENGLAND MILL SITUATION.

(*Special Correspondence.*)

The textile industry in New England has been through chaos during the past four weeks. The violent declines in the cotton market have completely unsettled the commodity situation and show the positive control of speculators; labor has flared up at Fall River and Webster, Mass., because of the operations of the 56-hour law in Massachusetts and Rhode Island, and a strike threatens; and last of all the cotton goods market has received a severe set back because of the break of the bull operations in cotton.

We New Englanders have had a nerve racking month; precedents have been shattered by the remarkable declines in spot and future cotton. The collapse of the famous Sully bull campaign of 1903-04 was eclipsed by the intense speculative activtity that controlled the New York market during the second week of January. When spot cotton reached about 13-3-4 cents, a large Fall River operator placed an order with his broker to buy 50,000 bales at from that price to 14 cents. Less than one-tenth of the order was executed before the report went out that the market was being supported by the bulls while in reality the buying was for actual consumption of two large mills in Fall River that will have to curtail heavily inside of two weeks if they can not get cotton at less than 14 cents, or do not manufacture at a big loss, as their contracts were based upon low price cotton.

The fabric market was just becoming adjusted to "at value" quotations or prices based upon 15 cent cotton; and during the last weeks of the year and first week in January there was a good volume of new business being placed at better prices. Ginghams and medium fine goods had been advanced to a point where manufacturing was profitable, and every indication pointed to a gradual adjustment of prices of finished goods to raw materials. But now it is chaos again!

The writer has made a canvas of the selling houses in Boston and Fall River to ascertain conditions existing in the fabric end of the industry. In Fall River, the opinion was pretty general that Mr. Borden has his fingers on the pulse of the print goods market and if his brokers establish the prices that were withdrawn during the middle of January, it will be an excellent indication of his confidence that prices are going to hold steady with an advancing tendency. On the other hand if Mr. Borden remains out of the print goods market, and bids are made

under the market, local mill treasurers will be inclined to consider further curtailment.

In Boston, the larger selling houses are holding prices unchanged, with no business resulting, until the raw cotton market re-establishes itself. Buyers and sellers are at an absolute deadlock, and until the situation clears itself there will be little business. Wellington, Sears & Co. are holding ducks and coarse goods firm at advanced prices, but admit that that there is little business except in the West, and they do not look for any change in the situation until either the bears or bulls get control of the New York market. Other commission houses in Boston make the same kind of a report, but many feel confident that the staple is going materially lower. The acreage for 1910 will probably be the largest in the history of the industry, so a banner crop is generally anticipated in this section.

There is very little demand for export. One order for 5,000 cases of drills for the Red Sea market was placed on the 18th of January for delivery in March and April at a price that shows the mill a small margin of profit. There is no Chinese or Japanese trade at present, although since the break in the market, quite a few inquiries have come by cable for sheetings but no orders have resulted. The South American trade has been taking quite an active interest in the ticking market; also several large orders for sateens have been placed for immediate shipment.

Yarns are in an unsettled condition with sales at from 1½ to 3 cents under the prices established at Charlotte, N. C., by the Southern spinners. The writer saw several telegrams that passed between a Boston commission house and a Southern yarn mill last week. The first telegram was sent by the selling house to the mill for a quotation on 14/2-ply yarn. The answer from the mill read "Best price 26 cents for 14/2-ply yarn." The next communication was sent one hour later by the selling house and read "Have sold 5,000 pounds of 14/2-ply yarn at 24 cents." The answer from the mill read "We confirm order for 5,000 pounds 14/2-ply yarn. Will ship from stock."

This is a fair illustration of the condition of the yarn market in this country. When there is a buyer his bid of several cents under the market is eagerly accepted by the spinner, and selling houses appreciate this fact too. The finer counts are in slightly improved demand while knitting yarns are steady with an excellent undertone to this market.

The labor situation is quite critical in Fall River and Webster, Mass. Operatives are dissatisfied with the 56-hour law, because it reduces their wages two hours, while several years ago when the 58-hour law became operative manufacturers allowed the same weekly wages for 58 hours as for 60 hours. Because of the generally unfavorable condition of the industry it is impossible to do this at the present time although the pressure that labor will probably bring to bear on the question may accomplish a compromise. In Fall River, twister and doffers are out at the American Thread Co.'s plant; and at the Flint, Mechanics, Merchants, Pocasset and Wamponoag mills, doffers and ring spinners have left their work. In Webster, the situation appears critical, and pressure is being brought to bear on Mrs. Slater, the owner of the Slater Cotton and Woolen Mills, to adjust the differences so that the operatives will return to work.

Manufacturers of textile machinery are not receiving quite as many orders as in last January and February, but they have sufficient unfilled orders to keep them busy for some months. Makers of spinning machinery are quite hopeful of a big year and have unfilled orders on their books that will care for their production into the summer months. The demand for weaving machinery is not so active as during the last six months of 1909, and in some cases prices have been shaded slightly to secure a large order from a competitor. For eight months there has been little competition, the maker of looms that could make the earliest delivery getting the order.

It is intimated among textile machinery men that Eugene Foss of the Maverick Cotton Mills, East Boston, Mass. has secured an interest in the Stafford Loom Co. and will equip the Maverick Mills with Stafford Ideal looms. If this is done it will be a fine order for the Stafford Co., and will be the best advertisement it ever had. Supply manufacturers are still sold ahead and in many cases are receiving more orders than during the latter part of 1909 when business was booming. Advances in prices have been made in belting and many other lines of small supplies.

Textile mill shares have been slightly weaker during the past month, although there has not been any indication of a general decline in the list. The liquidation has been largely by speculators who purchased issues in anticipation of large extra dividends which have not materialized and are selling their holdings at a substantial profit over purchase prices. Androscoggin Mills sold off 10 points from 210 to 200, while Cabot Mills has declined from a high of 110 in December to par. On the other hand Bates has held firm at the highest price on record 262 and Draper Co. sold at 170 or an advance of ten points in one month. Fall River shares have weakened in sympathy with the general decline in stocks and bonds. New Bedford mill shares hold at best prices. Wamsutta sold at 138½ an advance of $5 per share last week. It is entirely probable that mill shares will ease off slightly until the outlook becomes more hopeful.

CANADIAN COTTON MILLS.

Extensive Consumers of Various Factory Supplies.

Consul-General William Harrison Bradley, in forwarding from Montreal a list of cotton-consuming mills of Canada, brings out the following points:

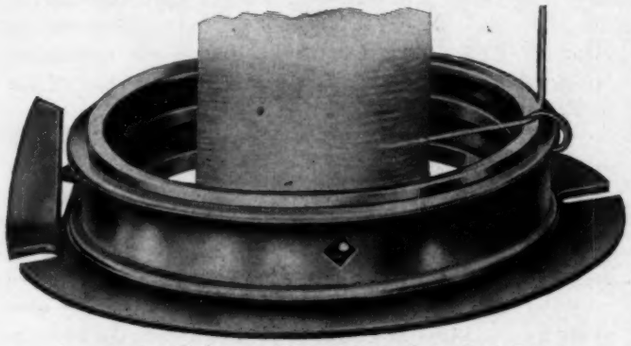
The increasing centralization at Montreal of capital and control of great Canadian manufacturing industries is evident. The list shows 818,542 spindles and 19,324 looms in mills or branches of mills controlled in Montreal.

The cotton mill industry in Canada began at Dundas, Ontario, in 1856. Up to 1878 only the coarsest goods were made. From this year the growth began. About 1886 consolidations took place which gave still greater impetus to the industry. To-day the mills make ducks and drills, cotton quilts, prints, dyed goods, linings, and colored prints, in addition to coarser grades. Mills of this kind are great consumers. Besides building material of all kinds, machinery, iron, coal, and raw cotton, they use an immense amount of supplies, such as oil, paper, bleaching powder, belting, twine, electric supplies, and tools. Over $1,500,000 is spent each year on supplies, excluding coal, which costs approximately $750,000. For raw cotton from the United States over $6,000,000 was paid last year. The total income of the industry was about $15,000,000.

NEW MACHINERY AND TRADE NOTES

AUTOMATIC TENSION REGULATING SPINNING RING.

A new spinning ring has been invented by F. H. Chapman, president of the Automatic Spinning Ring Co., Boston, Mass., the object of which is to secure an even tension on the yarn at all times during spinning, that is, from an empty to a full bobbin. A spinning frame equipped with these new rings does not require the use of separators on the machine.



AUTOMATIC TENSION REGULATING SPINNING RING.

The new ring is characterized by its simplicity, consisting essentially of two concentric rings, the outer ring being loosely fitted over the inner. This inner ring is secured at the bottom to a flange as shown in the accompanying illustration which enables it to be securely attached to the spinning frame. Projecting horizontally from the outside of the inner ring are three pins, one of which is shown in the illustration, the remaining two being located at equal distances around the ring. The outer ring contains corresponding square holes in which the pins are located, the pins acting as bearing surfaces for the outer ring during the operation of spinning.

The outer ring is slightly movable, which serves to regulate the tension on the yarn, being limited in its movement by the size of the square holes. The traveller is placed over both rings, as shown, in the same manner as for a solid ring. Before starting up the frame, the outer ring is in its lowest position, that is, the highest angles of the square holes are resting on the pins. In this position the ring would exert the greatest possible tension on the yarn, due to the increased friction thus put upon the traveller; when the spinning begins, the pull of the yarn through the traveller raises the outer ring and its tendency to rotate brings one side of each square hole in contact with its respective pin, as shown in the illustration. The action of the three pins keeps the two rings always in alignment, regardless of the movement of the outer ring. The tension on the yarn due to spinning, at the beginning of making the bobbin, causes the outer ring to be raised until the traveller runs freely without friction, said outer ring resting automatically on the pins.

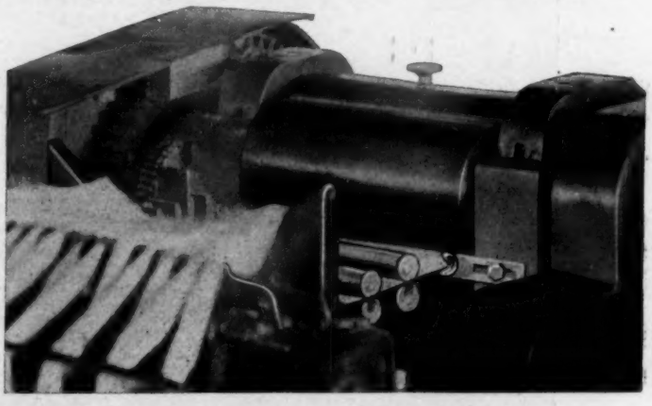
When the bobbins become filled sufficiently to cause the yarn to balloon, the outer ring gradually settles, producing more friction on the traveller and thus causing an automatic adjustment of the tension on the yarn, which is in this manner kept the same throughout the operation of filling the bobbins.

The advantages claimed for the new ring by keeping an even tension on the yarn are that ballooning is eliminated, thus making it unnecessary to use separators; better and smoother yarn is made, as the lint does not accumulate where it could be caught up by the yarn during spinning, and the even set of the twist makes a stronger yarn. Recent tests showed a gain of three to four per cent. in strength. Furthermore, an increased production is obtained by increasing the speed of the machine, which can be done with safety, as lighter travellers can be used, thus reducing the chance of excessive breakages of yarn during spinning. Again, the percentage of ends broken is very small, and less labor is required to run the frames. More yarn can also be wound on the bobbin, owing to the uniform tension, producing a firm bobbin throughout its length.

HARROP & FARRELL'S SLIVER GUIDE FOR SLIVER LAP MACHINES.

This device is a simple change in construction of sliver guides combined with an attachment for forming the selvage of laps after they leave the drawing rolls of the sliver lap machine. The advantages gained are a perfect selvage and no split laps, consequently a better product through all of the subsequent processes, which means a more perfect yarn and greater profit.

Card strippings of combed stock contain a large percentage of long staple which can be combed out of recarded strippings, but the difficulty of making a sliver lap of this waste that will run through the comber prevents the attempt in many cases. The perfect selvage and excellent regularity of the sliver lap made with these sliver guides reduce the amount of stripping waste that must be disposed of, to that which consists only of staple too short for combing. It is well known that no manufacturer figures



HARROP & FARRELL'S SLIVER GUIDE.

any profit on the waste he must sell. A reduction in the percentage of waste, while maintaining the proper standard of yarn product, always increases profits.

Old combs with this guide can be made to do very satisfactory work without the use of the ribbon lap process. Furthermore the ribbon lap process may be entirely left out of any plan for new machinery, or in any mill where ribbon lap machines are running they may be stopped and sold with the certainty of equally good work without them, by applying these sliver guides to the sliver lap machines.

When buying new combs these sliver guides will not add anything to their cost as they dispense entirely with the present sliver guide in common use. When it is desirable to change the number of ends up on the sliver lap machine with these guides the change may be made in two minutes to accommodate any number of ends up from twelve to twenty without any change of parts, by simply adjusting the height of the guide in front of the drawing rolls.

Other valuable features of this invention are obvious. Further information will be furnished by the inventors, Harrop & Farrell, East Taunton, Mass., who are prepared to attach the guides on receipt of order, or they may be attached by any mechanic in a very short time.

DRAPER CO.

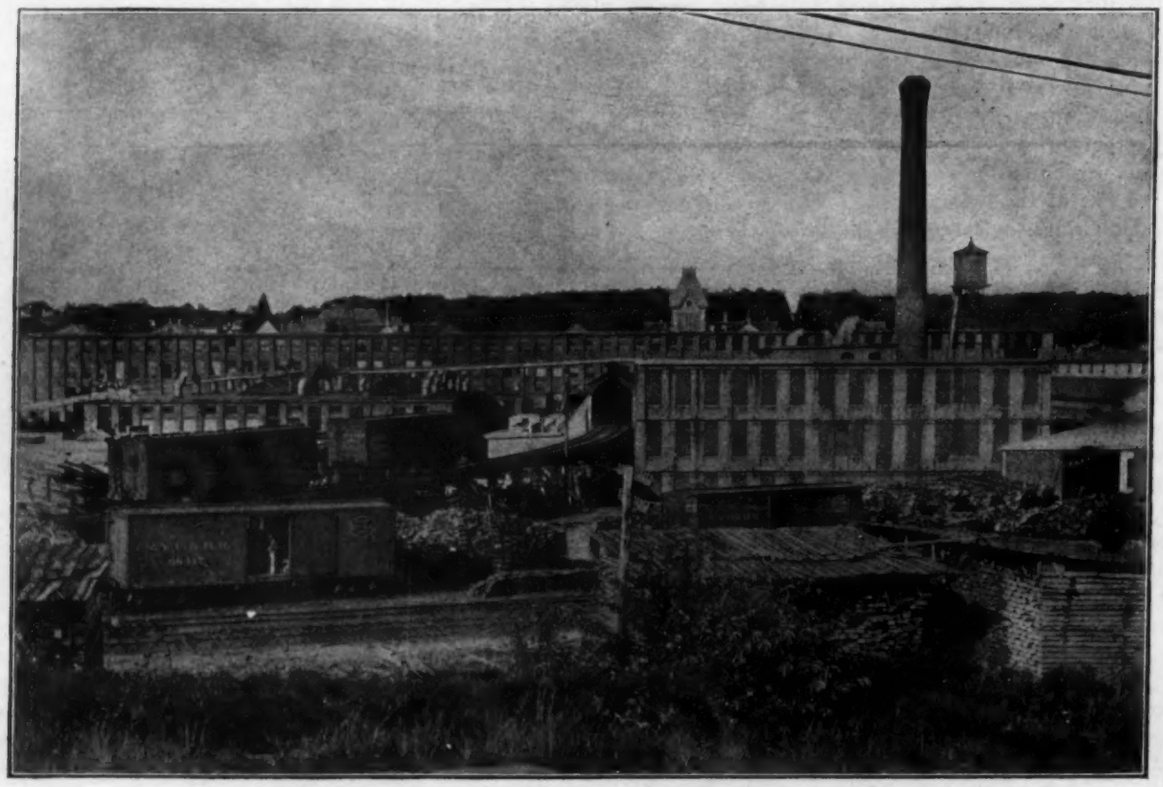
The accompanying illustration shows a view of the Draper Co.'s Works at Hopedale, Mass., which was printed in natural colors and used on the company's new 1910 calendar. The true colors for the picture were obtained from a color photograph by the new Lumiere process, and is the first instance of this new style of printing being used by any textile machinery builders. An illustration similar to the one shown is also given in the December issue of "Cotton Chats" published by the Draper Co. Among the other items of interest in that pamphlet are a view in the exhibition room, showing warpers, spoolers, twisters, etc., and a photograph of a ball of warp yarn wound on one the Draper Co.'s latest balling machines with a measuring device on the floor stand. A request is also made to those desiring to have "Cotton Chats" reach them regularly, to notify the company when they make any change of location or position.

AN IMPROVED NARROW FABRIC LOOM.

A new narrow fabric loom known as the quadruple type and shown in the accompanying illustration, was invented by Merrill O. Steere, Pawtucket, R. I., after several years of study and experimenting. Weaving takes place on both sides of the loom at the same time with 50 shuttles to a side. The loom is known as the quadruple type, owing to the fact that it is capable of weaving four kinds of work at the same time. The loom has many improvements over previous styles of narrow fabric looms, among them being the patent friction let off which uses only one-eighth of the amount of weight required on an ordinary narrow loom. No wires and straps that are usually required by the shuttle motion are used, and a number of gears are eliminated. With this new device, the shuttle mechanism is operated by the crank shaft arranged at one end of the loom.

The patent harness motion is another feature, as all wires, straps, hooks, links, jack straps, and jacks are not required. The cams run in oil and thus make a marked saving in the amount of oil used, at the same time reducing the amount of wear on the cams. The adjustment of the harnesses is quickly accomplished, and it has an added advantage in not getting out of position after being once properly set, as is the tendency of wire and strap combinations. The harnesses may be changed in less than one-quarter of the time usually required on ordinary looms.

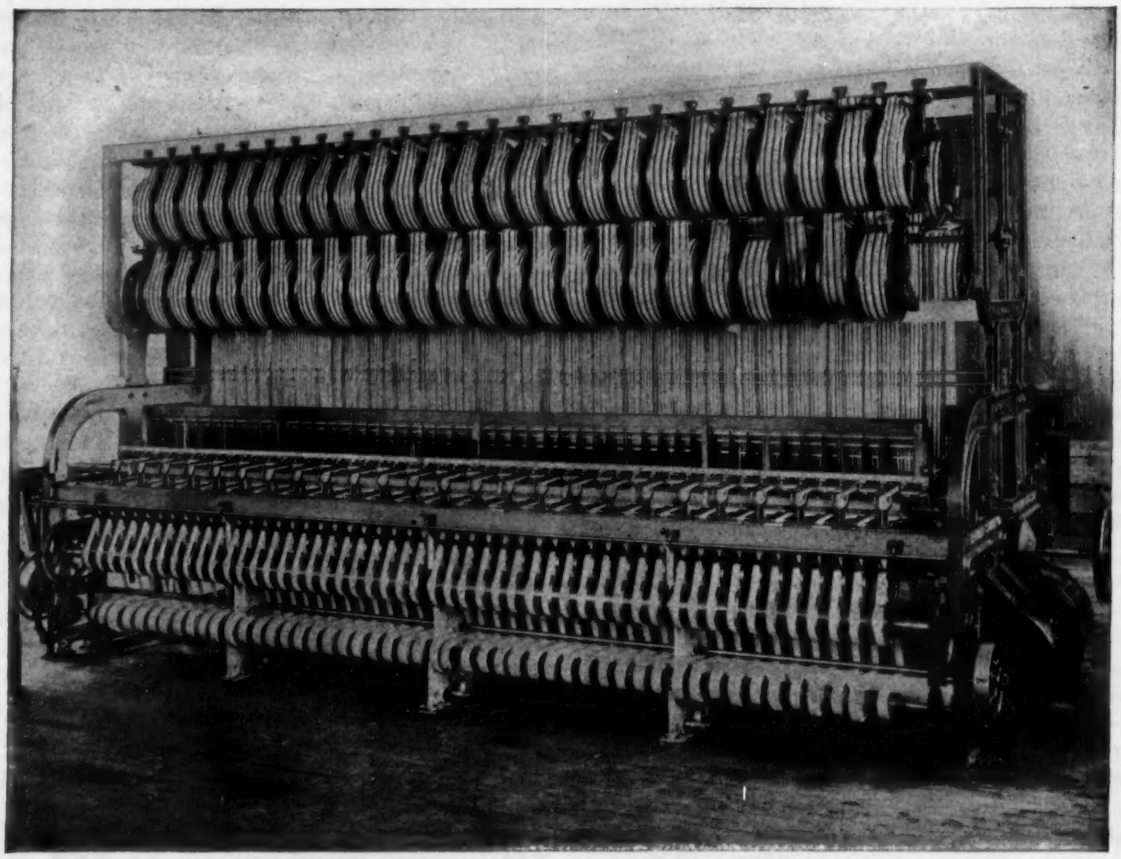
The patent warp stop motion and the mechanical stop motion are features that are up to date in every respect. A friction drive is used, which is a great power saver, as no power is lost when the loom is started. Only one-quarter of the time is required to change the slip spools on this loom compared with the ordinary loom, and fur-



Plant of the Draper Co., Hopedale, Mass.

thermore the warps are all overhead and within easy reach of the operator.

This loom also has a patented double crank shaft which causes the lays to beat up the fabric on both sides of the loom at the same time, thereby balancing the loom perfectly, which action produces a more even fabric and eliminates smashes. It has been in practical operation for over a year, and has proved satisfactory in every respect. This loom has been developed to a high standard and efficiency and is now established and in operation in the plant of the Westerly Narrow Fabric Co., Westerly, R. I., a finely equipped mill.



NEW QUADRUPLE TYPE NARROW FABRIC LOOM.

OBITUARY.

Leroy M. Harvey, Sales Manager of the Milwaukee District of the Allis-Chalmers Co., died at the New Partridge Hotel at Augusta, Ga., on January 19, 1910. Mr. Harvey had been in poor health for the past five months, and went to Augusta, hoping that the change of climate would benefit him.

Mr. Harvey was born at Oak Park, Ill., about thirty-seven years ago. He graduated in 1898 from the University of Michigan as an Electrical Engineer and entered the employ of the Westinghouse Electric & Mfg. Co., with whom he was connected for about a year. From there Mr. Harvey took up experimental work for the Siemens & Halske Co., in Chicago. Later he was in the Chicago sales office of the Northern Electric Mfg. Co. Six years ago he accepted a position in the sales department of the Allis-Chalmers Co., and about three years ago was made Manager of the Milwaukee District office, which position he held until his death.

AMERICAN MOISTENING CO., Boston, Mass., has received orders for humidifiers from the following mills: The Samoset Co., Valley Falls, R. I.; Calhoun Mills, Calhoun Falls, S. C.; The Lyman Mills, Holyoke, Mass.; and repeat orders from Grant Yarn Co., Fitchburg, Mass.; Barnard Mfg. Co., Fall River, Mass.; Farwell Mills, Lisbon, Me.; Danielson Cotton Mills, Danielson, Conn.; and Victor Mfg. Co., Greers, S. C.

Bleachers ought to give the new "Bellicosa" softener brought out by the ARABOL MFG. CO., 100 Williams St., New York, a thorough trial. The company claims that two and a half pounds of Bellicosa will equal twenty-five pounds of ordinary finishing paste. It is very easily handled, and is another advantage which, besides its cheapness, will help to introduce it.

FARBENFABRIKEN OF EBERFELD CO., New York City, has issued some very interesting color sheets showing a number of their latest dyes, giving samples of the dyed material and directions for dyeing. A number of the latest dyes used for cotton are: Diazo Brilliant Scarlet B. A. extra, and 3 B. A. extra, Diazo Fast Red 7 B. L., Benzo Fast Violet N. C., which is also suitable for dyeing silk and artificial silk, and Benzo Black H. W. which is well adapted for machine dyeing. This color will also prove excellent for half-wool according to the one-bath method.

Some new colors used for printing cotton fabrics are

Gallo Viridine V. D. powder, and Gallo Gray 2 B. D. powder and R. D. powder. These latter colors are printed with acetate of chrome. Full directions for printing are given on the color sheets.

Some bright colors for wool are illustrated in a series of color sheets, the dyes illustrated being Sulphon Yellow 5 G. R., Sulphon Orange G,, Diamond Black P. 2 B., Acid Anthracene Red G. and 3 B., Supramine Brown R., Oxychromine, Wool Fast Violet B., Diamond Blue Black B. R., Acid Chrome Blue F. F. B., and F. F. R., Fast Red V. R., and Alizarine Rubinole G. W. These colors are especially adapted for ladies' dress cloths, gentlemen's suitings, half wool, and also for loose material, slubbing and yarns. This handsome series of color sheets may be obtained by dyers by addressing the company in New York.

H. A. METZ & Co., 122 Hudson St., New York City, has just issued a folder, Series M, Number 7, showing light fast colors on ladies' cloth. The effects shown are very striking, and of great value to the dyer, as the samples are arranged to show the separate dyeings, and the combination effect of the three dyes used. A great variety of colors and combinations are given which should prove a great help in matching colors. This valuable folder may be obtained by any one interested by addressing the home office of the company.

CASSELLA COLOR CO., New York City, has just issued its cotton dyeing supplement Number 57, which refers to Immedial Green Blue C. V., Patented. This supplement is illustrated by eight dyeings showing this new product both as a self color and in combination with other dyes of the same group. The shades produced by this dyestuff are distinctly greenish in tone and are claimed to possess very great fastness to light, being exceedingly level. This new product is very useful for shading not only blues, but greens as well. It is also well adapted for machine dyeing, as well as for producing resist print styles on cotton fabrics. Like the other members of the Immedial group, this new dyestuff may be subjected to an after-treatment with bichromate of potash and sulfate of copper, the shade becoming bluer, while the resistance to washing and light is considerably increased. Those dyers who do not receive a copy of the supplement direct from the Cassela Color Co. should make inquiry for one at their nearest branch and they will be mailed promptly.

WESTERN ELECTRIC CO., New York City, has recently issued the following bulletins: Bulletin No. 1105, describing in detail its Intercommunicating Telephone Systems, the bulletin containing 40 pages of descriptive matter; Bulletins Nos. 1001 and 1002, which describe the construction and operating features of the Magneto Non-multiple Switchboards with self-restored and manually restored line signals, these bulletins containing illustrations of the different essential parts of line circuit apparatus, cord circuit apparatus as well as different styles of switchboards; Bulletin No. 5270 describing the "T" transformers, the bulletins showing the features of design and construction, and giving complete information concerning the essential parts; a booklet giving the reason for using the No. 1317 type Magneto telephone set, the booklet showing illustrations of all of the parts of this set and explaining the qualities of each part; an attractive folder which describes the necessity of having textile mill plants equipped with Hawthorn arc lamps, exhaust fans and motors, giving cuts to show the different ways in which a mill can use Hawthorn motors, especial attention being called to the importance of Hawthorn arc lamps in textile mills. Copies of these several bulletins and pamphlets may be had by addressing the home office of the company.

EUREKA FIRE MFG. HOSE CO., recently sold 2,000 ft. Red Cross fire hose to the city of Newburg, N. Y., at the price of 90 cents per foot coupled. An unauthorized statement in a local paper stated that the city had bought "Paragon" hose at 90 cents, which was a mistake. The company wishes to state that "Paragon" hose is never sold at less than the standard price of $1.00 per foot.

THOMAS B. JEFFERY & CO., have just issued a catalogue of the new "Rambler," which contains among other striking illustrations a beautiful color frontispiece of the new Rambler Fifty-Five, the leader of the Rambler line for 1910. The new Rambler is built in what is now considered to be the largest automobile factory in the world. Every part of the car is made in this plant which has been in operation every working day for nearly ten years. The new Ramblers are said to be superior in point of quality to all previous Ramblers, and to rank with cars of higher price. The new forty-five horse-power Rambler sells for $2,500.

UNITED STATES GIN CO., Boston, Mass., has a cotton gin on trial with F. F. Putney at Putney, Ga., who writes as follows: "I have watched the operation of this gin and believe it is a good machine. The staple is all right, and I think it will average 1/16 of an inch longer than the same cotton ginned with the saw gin, making the cotton worth at least one cent per pound more. The cotton also appears to have a better body and is smoother." Cotton classers who have tested the product pronounce the staple to be worth from 1 cent to 1½ cents per pound more than the same cotton from the saw gin.

THE JOSEPH DIXON CRUCIBLE CO. announces the publication of "Graphite as a Lubricant," Eleventh Edition. Every two or three years the Dixon Co. re-publishes "Graphite as a Lubricant," which has become a standard work with them. Each new edition is thoroughly revised and brought fully to date.

The present edition is more compact than its predecessor, the idea being to concentrate the information into quick, convenient form that is not bulky. The power house engineer will find the newest edition of "Graphite as a Lubricant" of considerable value to him, since it deals especially with the lubrication and treatment of power house machinery. A free copy of this 1910 Edition of "Graphite as a Lubricant," will be sent free to any one interested in machinery and better lubrication. Address Joseph Dixon Crucible Co., Jersey City, N. J.

JOHN W. BARLOW CO., Lawrence, Mass., announces the purchase of the tape, webbing and cotton belting business conducted by Robert M. Smith, Lawrence, Mass. It is the intention of the new company to add new machinery and increase its facilities for handling a larger business in an up-to-date manner.

THE LAGONDA MFG. CO., Springfield, Ohio, has just published an interesting pamphlet entitled, "Scale and the Vacuum." This describes some of the new cleaners, especially suited for removing scale from the tubes of surface condensers, ammonia condensers, etc., which the company has recently developed. It also contains valuable tables showing the losses in horse-power resulting from the reduction in vacuum, due to the formation of scale in condenser

tubes. Copies will be supplied free upon request to the company.

THE HARDIE-TYNES MFG. CO., Birmingham, Ala., operates the largest engine-building plant in the South, and has one of the best appointed plants of the kind to be found anywhere in the United States. The high reputation of Hardie-Tynes engines is attested by the very wide field of their installations. They are in operation all over the great lumber regions of the South and Southwest; in the textile, cotton-seed oil and furniture manufacturing centers of the South; in the manufacturing districts of the East, West and North, including power houses of public utilities corporations; and also on the Pacific Coast and in Mexico and other foreign countries, including the Far East.

The company builds Corliss and slide-valve engines, and can supply a machine for any service on short notice. The Hardie-Tynes engine is correct in design and construction, having the heavy weight properly adjusted, which enables it to withstand the strain of variable loads and continuously hard service. The company reports a very satisfactory volume of business; all prospective users of engines should secure a catalogue from the Birmingham office.

CORTRIGHT METAL SHINGLE ADVOCATE is now in its sixth year, and its total circulation is over 35,000 a month. The Advocate is published in the interest of Cortright metal roofing, and will be sent free to any one interested in building. All forms of roofing are discussed in its pages during the year. Applications for the Advocate should be addressed to Cortright Metal Roofing Co., 50 North 23rd St., Philadelphia, Pa.

FRANCIS R. WELLER, Civil and Hydraulic Engineer, Washington, D. C., has taken over the entire business of Pressey & Weller, Washington, D. C., by acquiring Mr. Pressey's interest in the firm.

RAYMOND D. BORDEN, cloth and yarn broker, formerly located on Rock St., Fall River, Mass., now occupies a very conveniently located office on the ground floor of the new building at 12 Third St., Fall River, Mass.

ACME KNITTING MACHINE & NEEDLE CO., Franklin, N. H., is the new name of the former Mayo Knitting Machine & Needle Co. The "Acme" seamless hosiery knitters are the principal product of that company and it is only natural that the name of the company should distinctly identify its product, hence the change.

TECHNICAL PUBLICITY ASSOCIATION OF NEW YORK CITY which meets on the second Thursday of each month, had a regular meeting on January 13th, with Secretary H. H. Kress in the chair. Short talks were made by C. R. Lippmann, Advertising Manager, Genuine Bangor Slate Co., Easton, Pa., Geo. W. Wharton, Advertising Manager, Jos. P. Day, Real Estate Operator, H. Tipper, Advertising Manager of the Texas Co., H. M. Horr, Advertising Manager of the Oakland Chemical Co., Barrett Smith, Advertising Manager of the Stone & Webster Engineering Corporation, Boston, Mass. Subsequently an energetic discussion of the uniform advertising contract proposed by the committee held the meeting until quite late. The proposed contract will again come up for final action at the next meeting February 10th.

THE VICKSBURG GOVERNOR CO., Vicksburg, Mich,. has issued a pamphlet describing its well-known Judson three-ball governor for traction or stationary engine service. It is applicable for steam, gas or gasoline engines. The new Judson is a slow-speed governor, but with sufficient velocity to regulate the speed very closely. This governor is equipped with the new mitre gear speeder, and the governor stem and valve stem are entirely separate. The speed may be increased or diminished by a hand wheel connected with the mitre gear, which raises or lowers the valve without changing the tension of the spring and without adding the least friction to any of the running parts of the governor.

INTERNATIONAL ACHESON GRAPHITE CO., Niagara Falls, N. Y., describes in a four-leaf pamphlet the different products made from Acheson graphite. The pure graphite known as grade 1340, is claimed to be the purest and best graphite for lubricating purposes on the market, and not only improves the lubricating quality of any oil or grease with which it is mixed, but gives a body which prevents the parts from wearing away, which occurs when oil or grease is used alone. The company makes several kinds of graphited greases composed of pure unctuous Acheson graphite grade 1340 and an exceptionally high-grade grease which serves as a carrier for the graphite, the two ingredients being mixed in proportion to give the best results. Number 1 is a fluid grease intended for transmission purposes and wherever a thin grease is needed; Number 2 is a soft grease for gear and cup use; Number 3 is a medium grease for gear and cup use; and Number 4 is a spongy grease, being known as ball-bearing lubricant. A copy of the pamphlet describing the different products may be obtained by addressing the company.

OILDAG, is the name of a new lubricant manufactured by the Acheson Oildag Co., Niagara Falls, N. Y., and which is thoroughly described, and the results of tests made by Professor Chas. F. Mabery of the Case School of Applied Science, by members of the Special Committee, and technical committee of the Automobile Club of America are given in pamphlet form. Several test charts are reproduced in the back part of the pamphlet showing the lubricating efficiency of Oildag. The preface of the pamphlet states that the past generation used animal fat for lubrication; the present generation is using petroleum oils; and the future generation will use Acheson graphite in the form of Oildag.

POWER SPECIALTY CO., 111 Broadway, New York, N. Y. has just brought out a special catalog on "Foster Superheaters," describing in detail this superheater, giving a large number of illustrations of different installations, besides giving a treatise on superheated steam and its advantages. It is stated that the saving in steam by superheating 100 degrees as compared with saturated steam would be for steam turbines 10 per cent.; triple expansion engines 12 per cent.; compound engines 14 per cent.; and simple engines 18 per cent. and over.

WESTINGHOUSE ELECTRIC & MFG. CO., Pittsburg, Pa., have issued a circular Number 1506 describing recent types of arc lamps and their operation, taking up typical light distribution of a direct current open arc, alternating current open arc, direct current enclosed arc with opal globe, direct current carbon flame arc, and Westinghouse metallic flame arc. The circular is well illustrated and should prove of interest to those concerned with mill lighting.

KEYSTONE LUBRICATING CO., Philadelphia, Pa., have just issued a couple of pamphlets on lubrication, one relating to the cotton mill and the other to the woolen and worsted mill. The subject of lubrication is dealt with in a very thorough manner, taking up the necessity for lubrication, its application, etc. The different machines found in the

cotton mill are discussed with reference to their lubrication and some very valuable information on the subject is given. A copy of either of these pamphlets may be obtained by addressing the company.

EUREKA FIRE HOSE MFG. CO. has opened an office at 610 Postal Telegraph Bldg., San Francisco, with W. A. Doggett, manager for handling the fire hose business on the Pacific Coast.

An agreement has been made by all fire hose manufacturers that on and after January 1st, 1910, samples of fire hose submitted with bids shall not measure over 6 inches in length.

All requests for samples will be gladly received, and given prompt and careful attention.

THE TAVELLA SHUTTLELESS LOOM CO. has started the manufacture of the shuttleless loom in its machine shop located at 347-349 Cambridge St., Boston, Mass. The company has recently received quite a number of orders for these looms, and is now in position to fill all orders for any quality of shutterless looms which are adapted to all kind of weaving from silk to carpets.

WELLER MFG. CO. CHICAGO, ILL., will build a new plant. Only three years ago this company added an addition to its plant, increasing the floor space at that time by 30,000 square feet, which is was thought would give ample room for a number of years. As an indication, however, of the rapid growth of the Weller Mfg. Co., and the demand for "Weller Made" goods, this company has recently purchased a tract of land containing eight acres located on the Chicago, Milwaukee & St. Paul R. R. at 44th Ave. and Cortland St., Chicago, where a new modern plant is to be erected, having a capacity of treble the present one.

The property acquired is now vacant and it is the intention of the company to erect buildings to accommodate its machine shop, sheet metal, conveyor, bucket, wood-working and foundry departments of the most modern and approved type for that class of work. The buildings will be steel construction throughout, with saw-tooth roofs with the exception of the foundry. They will be equipped with the most modern labor saving devices obtainable. The building for the storage of patterns will be of fire proof construction. There will be a modern office building, and shipping room will be designed for quick and accurate handling of all orders. It is expected to have the plant ready for occupancy by May 1st, 1910.

MILL NEWS.

Notices of mill projects, additions or improvements are solicited for this department.

Alabama.

AUBURN. Auburn Polytechnic Institute will have a mechanical and textile building to cost $40,000, the same having been recently authorized by the trustees of the Institute. The Textile Department will be equipped with the latest machinery.

HUNTSVILLE. Lowe Mfg. Co., will expend $80,000 in the enlargement of its weaving facilities. Work on the new addition will begin in a short time.

Colorado.

DENVER. Farmers' Unions of six Western states and the National Wool Growers' Association have indorsed a plan for building a number of woolen mills in the West to consume the 200,000,000 pounds of wool produced annually in that section. It is proposed to have the products of these Western mills sold through the Farmers' Union stores. It is estimated that 5,500 looms will be required to weave the product. Denver will probably be chosen as one location, as it is naturally a distributing point.

Connecticut.

HARTFORD. Campbell & Harris Knitting Co., have been incorporated by Gilbert Harris, J. J. Campbell and Cora R. Chaffin with a capital stock of $20,000 for manufacturing hosiery and knit goods.

ROCKVILLE. Hockanum Mills Co., are replacing an old-fashioned breast water wheel at their New England Mill, with a pair of turbine wheels.

Delaware.

DOVER. United States Linen Flax Co., of New York, has been incorporated with a capital stock of $3,000,000, the incorporators being Francis Fitch, C. T. Stackpole, Fred S. Randall, of New York, and Harry W. Davis, Wilmington, Del.

Georgia.

ATLANTA. Beaver Dam Mfg. Co., has been incorporated with a capital stock of $125,000 by Bailey Fowler, Griffin, Ga., John M. Wright, and Albert Fowler. The company has purchased the Witham Cotton Mill, Hartwell, Ga., from Asa G. Candler, and will remove the same to Fulton County. It is understood that the equipment will be increased when the change has been made.

FLOWERY BRANCH. W. W. Cooper is interested in the organization of a company to manufacture twine and rope, and he is prepared to receive proposals on the equipment of machinery.

JACKSON. Chas. M. Sears, Boston, Mass., is reported to be interested in the proposed establishment of a $500,000 cotton mill at this place. A 50-acre tract of land has been secured by the promoters as a site for the proposed mill.

MACON. C. K. Osigian is in correspondence with the Chamber of Commerce relative to the establishment of a silk farm and mill.

MACON. Manchester Mfg. Co., has issued $100,000 of bonds for improvements to its plant, the details of which have not been made public. The present equipment is 12,000 ring spindles producing hosiery yarns, etc.

MONTICELLO. At a meeting of the board of trade steps were taken with a view to securing a $400,000 cotton mill for this place.

QUITMAN. The Atlantic & Gulf Cotton Mills will soon enjoy the distinction of being the only mill in the world located in the Sea Island cotton section and using long staple cotton exclusively. The mill is replacing the short staple machinery with machines for working the Sea Island cotton, the product to be used in the manufacture of automobile tires. This improvement will cost about $50,000.

WEST POINT. E. B. Reed is interested in the organization of a company with a $500,000 capital stock to build a cotton mill.

Illinois.

CHICAGO. Arctic Knitting Mills have been incorporated with a capital stock of $20,000, by J. S. Wight, L. Cohen and I. Cohen, to manufacture and deal in knit goods and knitting machinery.

Indiana.

FORT WAYNE. The Old Fort Wayne Knitting Mills have had installed the machinery from the Minman Knitting Co.'s plant, Decatur, Ill., and have been started up with a large force of operatives.

INDIANAPOLIS. The Seymour Woolen Co. is installing new looms to take the place of old ones recently abandoned, and when the change is completed it will have an equipment of 68 looms.

Maine.

LEWISTON. Hill Mfg. Co., has just completed its new 6-story brick mill, and machinery is being installed. The cloth room is being moved into the new building and the space will be filled with looms. 500 additional looms have been ordered, of which 200 will be automatic. Operation of the machinery will probably be begun about February 1st.

LIMERICK. Limerick Mills has increased its capital stock from $200,000 to $300,000, by adding $100,000 to the common stock.

SANFORD. Goodall Worsted Co., is erecting an additional building 80x60 ft., four stories high. This extra space will be used for spinning and combing, and will increase the space now occupied by these departments by about 10,000. The work on the company's new mill at Kennbunk, Me., is nearing completion. It will be used exclusively for weaving.

Massachusetts.

CHICOPEE. Chicopee Mfg. Co., will issue $100,000 additional capital stock for the purpose of erecting a weave shed to be 240x150 ft., one story high. Modern equipment will be installed.

EAST BOSTON, MASS. The Maverick Mills are being re-arranged so that the machinery will be driven by electric motors. Several machines will be driven by a single motor. The contract for the necessary electrical machinery has been given to Allis-Chalmers Co. This will include a 1,500-K.W., 1,800-R.P.M., 60-cycle, 3-phase, 600-volt condensing steam turbo generator. A 15-K. W. motor generator set and a 15-K. W. engine driven set are provided for excitation. A four-panel switchboard will carry